



National Aeronautics and  
Space Administration  
Langley Research Center

Scientific and Technical  
Information Program Office

# Scientific and Technical Aerospace Reports

# STAR

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## NASA STI Program ... in Profile

Since its founding, NASA has been dedicated to the advancement of aeronautics and space science. The NASA scientific and technical information (STI) program plays a key part in helping NASA maintain this important role.

The NASA STI program operates under the auspices of the Agency Chief Information Officer. It collects, organizes, provides for archiving, and disseminates NASA's STI. The NASA STI program provides access to the NASA Aeronautics and Space Database and its public interface, the NASA Technical Report Server, thus providing one of the largest collections of aeronautical and space science STI in the world. Results are published in both non-NASA channels and by NASA in the NASA STI Report Series, which includes the following report types:

- **TECHNICAL PUBLICATION.** Reports of completed research or a major significant phase of research that present the results of NASA Programs and include extensive data or theoretical analysis. Includes compilations of significant scientific and technical data and information deemed to be of continuing reference value. NASA counterpart of peer-reviewed formal professional papers but has less stringent limitations on manuscript length and extent of graphic presentations.
- **TECHNICAL MEMORANDUM.** Scientific and technical findings that are preliminary or of specialized interest, e.g., quick release reports, working papers, and bibliographies that contain minimal annotation. Does not contain extensive analysis.
- **CONTRACTOR REPORT.** Scientific and technical findings by NASA-sponsored contractors and grantees.

- **CONFERENCE PUBLICATION.** Collected papers from scientific and technical conferences, symposia, seminars, or other meetings sponsored or co-sponsored by NASA.
- **SPECIAL PUBLICATION.** Scientific, technical, or historical information from NASA programs, projects, and missions, often concerned with subjects having substantial public interest.
- **TECHNICAL TRANSLATION.** English-language translations of foreign scientific and technical material pertinent to NASA's mission.

Specialized services also include creating custom thesauri, building customized databases, and organizing and publishing research results.

For more information about the NASA STI program, see the following:

- Access the NASA STI program home page at <http://www.sti.nasa.gov>
- E-mail your question via the Internet to [help@sti.nasa.gov](mailto:help@sti.nasa.gov)
- Fax your question to the NASA STI Help Desk at (301) 621-0134
- Phone the NASA STI Help Desk at (301) 621-0390
- Write to:  
NASA STI Help Desk  
NASA Center for AeroSpace Information  
7121 Standard Drive  
Hanover, MD 21076-1320

# Introduction

*Scientific and Technical Aerospace Reports (STAR)* is an online information resource listing citations and abstracts of NASA and world wide aerospace-related STI. Updated biweekly, *STAR* highlights the most recent additions to the NASA Aeronautics and Space Database. Through this resource, the NASA STI Program provides timely access to the most current aerospace-related Research & Development (R&D) results.

*STAR* subject coverage includes all aspects of aeronautics and space research and development, supporting basic and applied research, and application, as well as aerospace aspects of Earth resources, energy development, conservation, oceanography, environmental protection, urban transportation and other topics of high national priority. The listing is arranged first by 11 broad subject divisions, then within these divisions by 76 subject categories and includes two indexes: subject and author.

*STAR* includes citations to Research & Development (R&D) results reported in:

- NASA, NASA contractor, and NASA grantee reports
- Reports issued by other U.S. Government agencies, domestic and foreign institution, universities, and private firms
- Translations
- NASA-owned patents and patent applications
- Other U.S. Government agency and foreign patents and patent applications
- Domestic and foreign dissertations and theses

## The NASA STI Program

The NASA Scientific and Technical Information (STI) Program was established to support the objectives of NASA's missions and research to advance aeronautics and space science. By sharing information, the NASA STI Program ensures that the U.S. maintains its preeminence in aerospace-related industries and education, minimizes duplication of research, and increases research productivity.

Through the NASA Center for AeroSpace Information (CASI), the NASA STI Program acquires, processes, archives, announces and disseminates both NASA's internal STI and world-wide STI. The results of 20th and 21st century aeronautics and aerospace research and development, a worldwide investment totaling billions of dollars, have been captured, organized, and stored in the NASA Aeronautics and Space Database. New information is continually announced and made available as it is acquired, making this a dynamic and historical collection of value to business, industry, academia, federal institutions, and the general public.

The STI Program offers products and tools that allow efficient access to the wealth of information derived from global R&D efforts. In addition, customized services are available to help tailor this valuable resource to meet your specific needs.

For more information on the most up to date NASA STI, visit the STI Program's website at <http://www.sti.nasa.gov>.

# NASA STI Availability Information

## NASA Center for AeroSpace Information (CASI)

Through NASA CASI, the NASA STI Program offers many information products and services to the aerospace community and to the public, including access to a selection of full text of the NASA STI. Free registration with the program is available to NASA, U.S. Government agencies and contractors. To register, contact CASI at [help@sti.nasa.gov](mailto:help@sti.nasa.gov). Others should visit the program at [www.sti.nasa.gov](http://www.sti.nasa.gov). The 'search selected databases' button provides access to the NASA Technical Reports Server (TRS) – the publicly available contents of the NASA Aeronautics and Space Database.

Each citation in *STAR* indicates a 'Source of Availability'. When CASI is indicated, the user can order this information directly from CASI using the [STI Online Order Form](#) or contact [help@sti.nasa.gov](mailto:help@sti.nasa.gov) or telephone the CASI Help Desk at 301-621-0390. Before ordering you may access price code tables for STI [documents](#) and [videos](#). When information is not available from CASI, the source of the information is indicated when known.

NASA STI is also available to the public through Federal information organizations. NASA CASI disseminates publicly available NASA STI to the National Technical Information Service (NTIS) and to the Federal Depository Library Program (FDLP) through the Government Printing Office (GPO). In addition, NASA patents are available online from the U.S. Patent and Trademark Office.

## National Technical Information Service (NTIS)

The National Technical Information Service serves the American public as a central resource for unlimited, unclassified U.S. Government scientific, technical, engineering, and business related information. For more than 50 years NTIS has provided businesses, universities, and the public timely access to well over 2 million publications covering over 350 subject areas. Visit NTIS at <http://www.ntis.gov>.

## The Federal Depository Library Program (FDLP)

The U.S. Congress established the **Federal Depository Library Program (FDLP)** to ensure access by the American public to U.S. Government information. The program acquires and disseminates information products from all three branches of the U.S. Government to nearly 1,300 Federal depository libraries nationwide. The libraries maintain these information products as part of their existing collections and are responsible for assuring that the public has free access to the information. Locate the Federal Depository Libraries [http://www.access.gpo.gov/su\\_docs](http://www.access.gpo.gov/su_docs).

## The U.S. Patent and Trademark Office (USPTO)

The U.S. Patent and Trademark Office provides online access to full text patents and patent applications. The database includes patents back to 1976 plus some pre-1975 patents. Visit the USPTO at <http://www.uspto.gov/patft/>.

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[Subject Term Index](#)

[Personal Author Index](#)

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# SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

*A Biweekly Publication of the National Aeronautics and Space Administration*

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VOLUME 44, JANUARY 27, 2006

## 01

### AERONAUTICS (GENERAL)

Includes general research topics related to manned and unmanned aircraft and the problems of flight within the Earth's atmosphere. Also includes manufacturing, maintenance, and repair of aircraft. For specific topics in aeronautics, see categories 02 through 09. For information related to space vehicles see 12 Astronautics.

**20060002829** Lawrence Livermore National Lab., Livermore, CA USA

#### **DOE's Effort to Reduce Truck Aerodynamic Drag-Joint Experiments and Computations Lead to Smart Design**

McCallen, R. C.; Salari, K.; Ortega, J.; DeChant, L.; Hassan, B.; Jun. 22, 2004; 22 pp.; In English

Report No.(s): DE2005-15014289; UCRL-CONF-204819; No Copyright; Avail.: National Technical Information Service (NTIS)

At 70 miles per hour, overcoming aerodynamic drag represents about 65% of the total energy expenditure for a typical heavy truck vehicle. The goal of this US Department of Energy supported consortium is to establish a clear understanding of the drag producing flow phenomena. This is being accomplished through joint experiments and computations, leading to the smart design of drag reducing devices. This paper will describe our objective and approach, provide an overview of our efforts and accomplishments, and discuss our future direction.

NTIS

*Aerodynamic Drag; Drag Reduction; Trucks*

**20060003018** Lawrence Livermore National Lab., Livermore, CA USA

#### **July 2004 Working Group Meeting on Heavy Vehicle Aerodynamic Drag: Presentations, Summary of Comments and Conclusions**

McCallen, R.; Salari, K.; Ortega, J.; Castellucci, P.; Eastwood, C.; Aug. 16, 2004; 94 pp.; In English

Report No.(s): DE2005-15014757; UCRL-TR-206106; No Copyright; Avail.: National Technical Information Service (NTIS)

A Working Group Meeting on Heavy Vehicle Aerodynamic Drag was held in Portland, Oregon on July 1, 2004. The purpose of the meeting was to provide a summary of achievements, discuss pressing issues, present a general overview of future plans, and to provide a forum for dialogue with the Department of Energy (DOE) and industry representatives. The meeting was held in Portland, because the DOE Aero Team participated in an exclusive session on Heavy Truck Vehicle Aerodynamic Drag at the 34th AIAA Fluid Dynamics Conference and Exhibit in Portland on the morning of July 1st, just preceding our Working Group meeting. Even though the paper session was on the last day of the Conference, the Team presented to a full room of interested attendees.

NTIS

*Aerodynamic Drag; Conferences; General Overviews; Industries*

## 03

### AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; airport ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in 09 Research and Support Facilities (Air). Air traffic control is covered in 04 Aircraft Communications and Navigation. For related information see also 16 Space Transportation and Safety and 85 Technology Utilization and Surface Transportation.

**20060002994** Federal Aviation Administration, Washington, DC USA

#### **Study and Report to Congress on Civil Aviation Security Responsibilities and Funding, 1998**

Dec. 1998; 70 pp.; In English

Report No.(s): PB2006-103419; No Copyright; Avail.: CASI: [A04](#), Hardcopy

This report is provided to Congress by the Federal Aviation Administration (FAA) in response to the requirement for a study of and report regarding allocating civil aviation security responsibilities established by section 301 of the Federal Aviation Reauthorization Act of 1996 (Public Law 104-264). The study examines the evolution of aviation security responsibilities and finds that a consensus exists to retain the current system of shared responsibilities. The report does not recommend a transfer of air carrier responsibilities to either airport operators or the Federal Government. As a result, the report does not contain methodologies for such a transfer. The study recognizes the incremental increases in Federal Government involvement that have taken place and predicts that such increases will continue, perhaps in the field of aviation security training. The study examines discussions of funding for aviation security and considers a number of views. The report contains options for aviation security funding and states the Administration's position that any FAA activities, including security activities, be derived from charges paid by users of the National Airspace System. The report offers no recommendations in the absence of a consensus on the source of funding. The FAA believes that there should be no change to the current system of shared responsibilities or funding at this time and therefore offers no legislative proposals.

NTIS

*Airline Operations; Civil Aviation; Commercial Aircraft; Congressional Reports; Security*

## 05

### AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance and evaluation, and aircraft and flight simulation technology. For related information see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics. For land transportation vehicles see 85 Technology Utilization and Surface Transportation.

**20060002896** Federal Aviation Administration, Oklahoma City, OK, USA

#### **Instrument Rating Knowledge Test Guide, 15 October 2003**

Oct. 15, 2003; 14 pp.; In English

Report No.(s): PB2006-102329; FAA-G-8082-13A; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Knowledge tests for the instrument rating consist of a selection of questions in the areas that pertain to the Code of Federal Regulations (CFRs) requirements, attitude instrument flying, flight planning, meteorology, the pilot's responsibility when operating under instrument flight rules (IFR); and IFR operations pertinent to preflight, departure, en route, and arrival. The Instrument Rating-Foreign pilot test includes questions that pertain to instrument flight rules and related procedures. These tests can be administered by any authorized testing center.

NTIS

*Instrument Flight Rules; Ratings; Regulations*

**20060002998** Federal Aviation Administration, Washington, DC, USA

#### **Federal Aviation Administration Aircraft Certification Service Technical Report: Aviation Fastener Audit Final Report, June 13, 2001**

Jun. 13, 2001; 126 pp.; In English

Report No.(s): PB2006-103706; FAA-IR-01-02; No Copyright; Avail.: National Technical Information Service (NTIS)

This technical report presents the results of an audit conducted by the Federal Aviation Administration (FAA), Aircraft Certification Service. The purpose of the audit was to investigate the cause of variation in measurement (including the effect of different types of measuring equipment), ascertain the airworthiness of fasteners used in the production of civil aircraft, and assess the threaded fastener industry's compliance with FAA approved design data and applicable industry specifications.

NTIS

*Certification; Fasteners*

## 06

### AVIONICS AND AIRCRAFT INSTRUMENTATION

Includes all avionics systems, cockpit and cabin display devices, and flight instruments intended for use in aircraft. For related information see also 04 Aircraft Communications and Navigation; 08 Aircraft Stability and Control; 19 Spacecraft Instrumentation and Astrionics; and 35 Instrumentation and Photography.

**20060002985** Arizona State Univ., Tempe, AZ USA, Honeywell Labs., Phoenix, AZ, USA

#### **Handbook for Ethernet-Based Aviation Databases: Certification and Design Considerations**

Lee, Y. H.; Rachlin, E.; Scandura, P. A.; Nov. 2005; 60 pp.; In English

Report No.(s): PB2006-102389; No Copyright; Avail.: CASI: [A04](#), Hardcopy

The purpose of this Handbook is to provide the network designer and developer with some guidelines to develop an Ethernet databus framework deployable in aircraft avionics systems. The Handbook gives design rationale and requirements for the use of Ethernet-based networks in the avionics environment and identifies the relevant issues and concerns regarding the determinism of the databus system. The Handbook will aid in the process of qualifying an Ethernet-based databus as part of the overall aircraft certification. It focuses on identifying any and all aspects of the product that may impact its qualification. Some qualification issues related with Ethernet-based aviation databuses are discussed. The general acceptance criteria for the qualification of avionics databuses as well as the evaluation criteria specific to Ethernet-based databuses are discussed. The Handbook describes the safety, performance, and reliability requirements of an Ethernet-based databus. Using the requirements of Ethernet-based databuses as a basis, the guidelines to design Ethernet-based aviation databuses and to address nondeterministic factors are illustrated. This Handbook does not constitute Federal Aviation Administration certification policy or guidance but may be used as input to future policy and guidance.

NTIS

*Avionics; Certification; Ethernet; Handbooks*

**20060002987** Hughes Technical Center, Atlantic City International Airport, NJ, USA

**Alternating Yellow and Green Taxiway Centerline as a Runway Safety Enhancement**

Patterson, J. W.; Nov. 2005; 22 pp.; In English

Report No.(s): PB2006-102391; No Copyright; Avail.: CASI: [A03](#), Hardcopy

This research effort was conducted to investigate and validate the suitability of installing alternating yellow and green taxiway centerline lights on taxiway segments located between the runway hold position marking and the runway centerline in the direction approaching the runway. This lighting configuration would serve as a visual cue to pilots and vehicle drivers that they are about to enter the runway environment/runway safety area (RSA). The objective of this research effort was to determine how the proposed lighting configuration would appear to pilots approaching the hold line (runway environment/RSA), if presently available lighting fixtures are adequate for the purpose, if present spacing standards are adequate for the purpose, if pilots interpret the purpose of the alternating yellow and green taxiway centerline lighting configuration correctly, and the cost factors involved in making such a change. Having considered all of the data and information gathered during this evaluation effort, illuminating the runway environment/RSA area with alternating yellow and green taxiway centerline fixtures was found to be a cost-efficient, easy to deploy tool that will assist in reducing runway incursions at those airports that have existing taxiway centerline lights.

NTIS

*Airports; Augmentation; Color; Illuminating; Luminaires; Runways; Safety*

**20060003021** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-103360; EC02-31I-334511(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing search, detection, navigation, guidance, aeronautical, and nautical systems and instruments. Examples of products made by these establishments are aircraft instruments (except engine), flight recorders, navigational instruments and systems, radar systems and equipment, and sonar systems and equipment.

NTIS

*Census; Detection; Economic Analysis; Economics; Industries; Manufacturing; Navigation Instruments*

## ASTRONAUTICS (GENERAL)

Includes general research topics related to space flight and manned and unmanned space vehicles, platforms or objects launched into, or assembled in, outer space; and related components and equipment. Also includes manufacturing and maintenance of such vehicles or platforms. For specific topics in astronautics see *categories 13 through 20*. For extraterrestrial exploration see *91 Lunar and Planetary Science and Exploration*.

**20060002957** Institute of Space Medico-Engineering, Beijing, China

### **Space Medicine & Medical Engineering (Hangtian Yixue Yu Yixue Gongcheng) Volume 18, Number 4, August 2005**

Aug. 2005; 90 pp.; In Chinese

Report No.(s): PB2006-100635; No Copyright; Avail.: CASI: [A05](#), Hardcopy

Contents: Measurement and Evaluation of Environmental Factors in Underground Construction Site (In English); Non-Rigid Medical Image Registration Algorithm Based on Modally Controlled Free Form Deformation (In English); Automatic Segmentation of Echocardiography Based on a Morphological Reconstruction Algorithm; Regulative Effects of Chinese Herb-compound on Blood Rheology and Circulatory System of Rabbits under Simulated Weightlessness; Effects of Simulated Weightlessness on ALP, ACP, Collagen I and Biomechanics of Hind-Limb Bones in Rats; Effects of 100 Hz Vibration on Ultrastructure of Soleus Muscle in Tail-suspended Rats; Effects of Ligustrazine and Radix Astragali on Activities of Myosin Adenosine Triphosphatase of Soleus Muscle and Muscle Atrophy in Tail-suspended Rats; Effects of Hypoxic Acclimatization on Myocardial Sarcoplasmic Reticulum ATPase and  $45\text{Ca}^{2+}$  Uptake in Rats; Quantitative Ultrasonic Naked Gene Delivery and the Effect Control; Study on Long-term Biomechanical Characteristics Effect of Postage Stamp Autograft of Expanded Skin; Boundary Extraction of Ultrasonic Breast Tumor Image Based on Gray-Level Threshold Segmentation and Dynamic Programming; Diagnosis and Exercise Therapeutic Effects Evaluation of Non-specific Chronic Low-back Pain Based on Surface Electromyography; Experimental Study of Pilots' Scan and Performance Workloads; Effects of Oxygen-increased Respirator of  $\text{SaO}_2$  and Heart Rate under Plateau Environment; Brief Report: Design of Software for Fluorescence Microscopy System to Measure Cytosolic Free Calcium in Living Cell; Prevention of Rhodiola-astragalus Membraneaceous Compounds against Simulated Plateau Hypoxia Brain Injury in Rats; A New Type of Active Noise Cancellation Earmuffs; Citation Analysis of Space Medicine & Medical Engineering 1999-2004.

NTIS

*Aerospace Medicine; Life Sciences*

**20060002997** Federal Aviation Administration, Washington, DC, USA

### **Commercial Space Transportation Forecasts, 2000**

May 2000; 72 pp.; In English

Report No.(s): PB2006-103703; No Copyright; Avail.: National Technical Information Service (NTIS)

The Federal Aviation Administration's Associate Administrator for Commercial Space Transportation (AST) licenses and regulates U.S. commercial space launch activity as authorized by Executive Order 12465, Commercial Expendable Launch Vehicle Activities, and the Commercial Space Launch Act of 1984, as amended. AST's mission is to license and regulate commercial launch operations to ensure public health and safety and the safety of property, and to protect national security and foreign policy interests of the USA during commercial launch operations. The Commercial Space Launch Act of 1984 and the 1996 National Space Policy also direct the Federal Aviation Administration to encourage, facilitate, and promote commercial launches. The Commercial Space Transportation Advisory Committee (COMSTAC) provides information, advice, and recommendations to the Administrator of the Federal Aviation Administration within the Department of Transportation (DOT) on matters relating to the U.S. commercial space transportation industry.

NTIS

*Forecasting; Launch Vehicles; Market Research; Space Commercialization; Space Transportation; Space Transportation System*

## 15

### LAUNCH VEHICLES AND LAUNCH OPERATIONS

Includes all classes of launch vehicles, launch/space vehicle systems, and boosters; and launch operations. For related information see also *18 Spacecraft Design, Testing and Performance*; and *20 Spacecraft Propulsion and Power*.

**20060002996** Federal Aviation Administration, Washington, DC, USA

#### **Commercial Space Transportation Forecasts, 2005**

May 2005; 70 pp.; In English

Report No.(s): PB2006-103704; No Copyright; Avail.: National Technical Information Service (NTIS)

The Federal Aviation Administrations Office of Commercial Space Transportation (FAA/AST) licenses and regulates U.S. commercial space launch and reentry activity for the Department of Transportation as authorized by Executive Order 12465 (Commercial Expendable Launch Vehicle Activities) and 49 USA Code Subtitle IX, Chapter 701 (formerly the Commercial Space Launch Act). ASTs mission is to license and regulate commercial launch and reentry operations to protect public health and safety, the safety of property, and the national security and foreign policy interests of the USA. Chapter 701 and the 2004 U.S. Space Transportation Policy also direct the Department of Transportation to encourage, facilitate, and promote commercial launches and reentries.

NTIS

*Forecasting; Launch Vehicles; Market Research; Space Commercialization; Space Transportation*

## 20

### SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information see also *07 Aircraft Propulsion and Power*, *28 Propellants and Fuels*, *15 Launch Vehicles and Launch Operations*, and *44 Energy Production and Conversion*.

**20060003012** Bureau of the Census, Washington, DC, USA

#### **Economic Census 2002: Manufacturing, Industry Series. Lawn and Garden Tractor and Home Lawn and Garden Equipment Manufacturing**

Dec. 2004; 54 pp.; In English

Report No.(s): PB2006-103293; EC02-31I-333112(RV); No Copyright; Avail.: CASI: [A04](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nations economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in 2 and 7. The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions.

NTIS

*Census; Economic Analysis; Economics; Engine Design; Industries; Manufacturing; Tractors*

## 23

### CHEMISTRY AND MATERIALS (GENERAL)

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft. For specific topics in chemistry and materials see *categories 25 through 29*. For astrochemistry see category *90 Astrophysics*.

**20060002766** Ohio State Univ., Columbus, OH, USA

#### **Improvements in Sand Mold/Core Technology: Effects on Casting Finish**

January 2003; 66 pp.; In English

Report No.(s): DE2005-841468; No Copyright; Avail.: National Technical Information Service (NTIS)

In this study, the development and impact of density gradients on metal castings were investigated using sand molds/cores from both industry and from in-house production. In spite of the size of the castings market, almost no quantitative information about density variation within the molds/cores themselves is available. In particular, a predictive understanding of how structure and binder content/chemistry/mixing contribute to the final surface finish of these products does not exist. In this

program we attempted to bridge this gap by working directly with domestic companies in examining the issues of surface finish and thermal reclamation costs resulting from the use of sand molds/cores. We show that these can be substantially reduced by the development of an in-depth understanding of density variations that correlate to surface finish. Our experimental tools and our experience with them made us uniquely qualified to achieve technical progress.

NTIS

*Casting; Sands*

**20060002786** Pennsylvania State Univ., University Park, PA, USA

**Development of Advanced Electrochemical Emission Spectroscopy for Monitoring Corrosion in Simulated DOE Liquid Waste**

MacDonald, D. D.; Marx, B. M.; Ahn, S.; de Ruiz, J.; Soundararajan, B.; Jul. 12, 2005; 206 pp.; In English

Report No.(s): DE2005-841868; No Copyright; Avail.: National Technical Information Service (NTIS)

The different tasks that have been carried out under the current program are as follows: (1) Theoretical and experimental assessment of general corrosion of iron/steel in borate buffer solutions by using electrochemical impedance spectroscopy (EIS), ellipsometry and XPS techniques; (2) Development of a damage function analysis (DFA), which would help in predicting the accumulation of damage due to pitting corrosion in an environment prototypical of DOE liquid waste systems; (3) Experimental measurement of crack growth rate, acoustic emission signals, and coupling currents for fracture in carbon and low alloy steels as functions of mechanical (stress intensity), chemical (conductivity), electrochemical (corrosion potential, ECP), and microstructural (grain size, precipitate size, etc) variables in a systematic manner, with particular attention being focused on the structure of the noise in the current and its correlation with the acoustic emissions; (4) Development of fracture mechanisms for carbon and low alloy steels that are consistent with the crack growth rate, coupling current data and acoustic emissions; (5) Inserting advanced crack growth rate models for SCC into existing deterministic codes for predicting the evolution of corrosion damage in DOE liquid waste storage tanks; (6) Computer simulation of the anodic and cathodic activity on the surface of the steel samples in order to exactly predict the corrosion mechanisms; (7) Wavelet analysis of EC noise data from steel samples undergoing corrosion in an environment similar to that of the high level waste storage containers, to extract data pertaining to general, pitting and stress corrosion processes, from the overall data.

NTIS

*Corrosion; Emission Spectra; Liquid Wastes*

**20060002790** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Petroleum Lubricating Oil and Grease Manufacturing**

Dec. 2004; 48 pp.; In English

Report No.(s): PB2006-102695; EC02-31I-324191(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

This report is about the U.S. industry consisting of establishments primarily engaged in blending or compounding refined petroleum to make lubricating oils and greases and/or re-refining used petroleum lubricating oils.

NTIS

*Census; Crude Oil; Economics; Greases; Industries; Lubricating Oils; Manufacturing*

**20060002794** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Fiber Can, Tube, Drum, and Similar Products Manufacturing**

Jan. 2005; 50 pp.; In English

Report No.(s): PB2006-102710; EC02-31I-321214(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry

comprises establishments primarily engaged in converting paperboard into fiber cans, tubes, drums, and similar products without manufacturing paperboard.

NTIS

*Cans; Census; Drums (Containers); Economic Analysis; Economics; Industries; Manufacturing*

**20060002796** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Nonfolding Sanitary Food Container Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-102711; EC02-31I-321215(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in converting sanitary foodboard into food containers (except folding).

NTIS

*Census; Economic Analysis; Economics; Industries; Manufacturing; Packaging*

**20060002797** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Coated and Laminated Packaging Paper and Plastics Film Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-102712; EC02-31I-321221(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in: 1. cutting and coating paper and 2. cutting and laminating paper with other flexible materials (except plastics to plastics or foil to paper laminates). The products made in this industry are made from purchased sheet materials and may be printed in the same establishment.

NTIS

*Census; Coatings; Economic Analysis; Economics; Industries; Laminates; Manufacturing; Packaging; Plastics; Polymeric Films*

**20060002799** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Plastics, Foil, and Coated Paper Bag Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-102714; EC02-31I-322223(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These

reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing bags of coated paper, of metal foil, or of laminated or coated combinations of plastics, foil, and paper, whether or not printed.

NTIS

*Bags; Census; Coatings; Economic Analysis; Economics; Industries; Manufacturing; Plastics*

**20060002800** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Laminated Aluminum Foil Manufacturing for Flexible Packaging Uses**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-102716; EC02-31I-322225(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in laminating aluminum and other metal foil into products with flexible packaging uses or gift wrap and other packaging wrap applications.

NTIS

*Aluminum; Census; Economic Analysis; Economics; Industries; Laminates; Manufacturing; Metal Foils; Packaging*

**20060002803** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Blankbook, Looseleaf Binders, and Devices Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-102967; EC02-31I-323118(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing blankbooks, looseleaf devices, and binders. Establishments in this industry may print or print and bind.

NTIS

*Binders (Materials); Census; Economic Analysis; Economics; Industries; Manufacturing; Printing*

**20060002806** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Industrial Gas Manufacturing**

Sep. 2004; 50 pp.; In English

Report No.(s): PB2006-102973; EC02-31I-325120(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product

estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This industry comprises establishments primarily engaged in manufacturing industrial organic and inorganic gases in compressed, liquid, and solid forms.

NTIS

*Census; Economic Analysis; Economics; Industries; Manufacturing*

**20060002810** California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

**Resolution Quality and Atom Positions in Sub-Angstrom Electron Microscopy**

O'Keefe, M.; Allard, L. F.; Blom, D. A.; Feb. 2005; 8 pp.; In English

Report No.(s): DE2005-842050; LLBNL-57524; No Copyright; Avail.: Department of Energy Information Bridge

Ability to determine whether an image peak represents one single atom or several depends on resolution of the HR-(S)TEM. Rayleigh's resolution criterion, an accepted standard in optics, was derived as a means for judging when two image intensity peaks from two sources of light (stars) are distinguishable from a single source. Atom spacings closer than the Rayleigh limit have been resolved in HR-TEM, suggesting that it may be useful to consider other limits, such as the Sparrow resolution criterion

NTIS

*Electron Microscopy; Rayleigh Scattering*

**20060002853** Lawrence Livermore National Lab., Livermore, CA USA

**Water Under Extreme Conditions**

Goldman, N.; Fried, L.; Mar. 22, 2004; 30 pp.; In English

Report No.(s): DE2005-15013907; UCRL-CONF-203081; No Copyright; Avail.: National Technical Information Service (NTIS)

No abstract available

*High Pressure; High Temperature; Water*

**20060002886** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Surface Active Agent Manufacturing**

Jan. 2004; 50 pp.; In English

Report No.(s): PB2006-102989; EC02-31I-325613(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry group comprises establishments primarily engaged in one or more of the following: 1. manufacturing bulk surface active agents for use as wetting agents, emulsifiers, and penetrants, and/or 2. manufacturing textiles and leather finishing agents used to reduce tension or speed the drying process.

NTIS

*Census; Economic Analysis; Economics; Industries; Manufacturing; Surfactants*

**20060002910** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Ethyl Alcohol Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-102980; EC02-31I-325193(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change in the following reports. This U.S. industry comprises establishments primarily engaged in manufacturing nonpotable ethyl alcohol.

NTIS

*Census; Economic Analysis; Economics; Ethyl Alcohol; Industries; Manufacturing*

**20060002924** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. All Other Basic Inorganic Chemical Manufacturing**

Dec. 2004; 52 pp.; In English

Report No.(s): PB2006-103042; EC02-31I-325188(RV); No Copyright; Avail.: CASI: [A04](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing basic inorganic chemicals (except industrial gases, inorganic dyes and pigments, alkalies and chlorine, and carbon black).

NTIS

*Census; Economic Analysis; Economics; Industries; Manufacturing*

**20060002959** Lawrence Livermore National Lab., Livermore, CA USA

**Ultrasonic NDE of Multilayered Structures**

Quarry, M. J.; Fisher, K. A.; Lehman, S. K.; Mar. 03, 2005; 16 pp.; In English

Report No.(s): DE2005-15011564; UCRL-TR-210179; No Copyright; Avail.: National Technical Information Service (NTIS)

This project developed ultrasonic nondestructive evaluation techniques based on guided and bulk waves in multilayered structures using arrays. First, a guided wave technique was developed by preferentially exciting dominant modes with energy in the layer of interest via an ultrasonic array. Second, a bulk wave technique uses Fermat's principle of least time as well as wave-based properties to reconstruct array data and image the multilayered structure. The guided wave technique enables the inspection of inaccessible areas of a multilayered structure without disassembling it. Guided waves propagate using the multilayer as a waveguide into the inaccessible areas from an accessible position. Inspecting multi-layered structures with a guided wave relies on exciting modes with sufficient energy in the layer of interest. Multilayered structures are modeled to determine the possible modes and their distribution of energy across the thickness.

NTIS

*Algorithms; Nondestructive Tests; Ultrasonic Radiation*

**20060002986** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Mineral Wool Manufacturing**

Jan. 2005; 50 pp.; In English

Report No.(s): PB2006-103029; EC02-31I-327993(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The

economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing mineral wool and mineral wool (i.e., fiberglass) insulation products made of such siliceous materials as rock, slag, and glass or combinations thereof.

NTIS

*Census; Economic Analysis; Economics; Fibers; Industries; Insulation; Manufacturing; Minerals*

**20060003001** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Polystyrene Foam Product Manufacturing**

Dec. 2004; 52 pp.; In English

Report No.(s): PB2006-103051; EC02-31I-326140(RV); No Copyright; Avail.: CASI: [A04](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing polystyrene foam products.

NTIS

*Census; Economic Analysis; Economics; Foams; Industries; Manufacturing; Polystyrene*

**20060003002** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Urethane and Other Foam Product (Except Polystyrene) Manufacturing**

Dec. 2004; 52 pp.; In English

Report No.(s): PB2006-103052; EC02-31I-326150(RV); No Copyright; Avail.: CASI: [A04](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing plastics foam products (except polystyrene).

NTIS

*Census; Economic Analysis; Economics; Foams; Industries; Manufacturing; Polystyrene; Urethanes*

**20060003004** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Toilet Preparation Manufacturing**

Dec. 2004; 54 pp.; In English

Report No.(s): PB2006-103057; EC02-31I-325620(RV); No Copyright; Avail.: CASI: [A04](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The

economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in preparing, blending, compounding, and packaging toilet preparations, such as perfumes, shaving preparations, hair preparations, face creams, lotions (including sunscreens), and other cosmetic preparations.

NTIS

*Census; Economic Analysis; Economics; Industries; Manufacturing; Toilets*

**20060003006** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Adhesive Manufacturing**

Dec. 2004; 52 pp.; In English

Report No.(s): PB2006-103047; EC02-31I-325520(RV); No Copyright; Avail.: CASI: [A04](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing adhesives, glues, and caulking compounds.

NTIS

*Adhesives; Census; Economic Analysis; Economics; Industries; Manufacturing*

**20060003007** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Enameled Iron and Metal Sanitary Ware Manufacturing**

Dec. 2004; 52 pp.; In English

Report No.(s): PB2006-103282; EC02-31I-332998(RV); No Copyright; Avail.: CASI: [A04](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nations economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in 2 and 7. The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions.

NTIS

*Census; Economic Analysis; Economics; Enamels; Industries; Iron; Manufacturing; Steels*

**20060003014** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Polish and Other Sanitation Good Manufacturing**

Dec. 2004; 52 pp.; In English

Report No.(s): PB2006-103049; EC02-31I-325612(RV); No Copyright; Avail.: CASI: [A04](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of

materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing and packaging polishes and specialty cleaning preparations. NTIS

*Census; Coal; Economic Analysis; Economics; Industries; Manufacturing; Sanitation; Surface Finishing*

**20060003019** Lawrence Livermore National Lab., Livermore, CA USA

**Welding Stainless Steels and Refractory Metals Using Diode-Pumped Continuous Wave Nd: YAG Lasers**

Palmer, T. A.; Elmer, J. W.; Pong, R.; Gauthier, M. D.; Sep. 30, 2004; 82 pp.; In English

Report No.(s): DE2005-15014822; UCRL-TR-206885; No Copyright; Avail.: National Technical Information Service (NTIS)

A Rofin Sinar DY-022 diode pumped Continuous Wave (CW) Nd:YAG laser welding system has recently been installed at Lawrence Livermore National Laboratory. This modern laser technology is being investigated as a replacement for technologies, including electron beam and pulsed Nd:YAG laser welding, currently in use within the Department of Energy (DOE) complex. This report details a series of initial tests performed on this welding system in an attempt to characterize its capabilities for a two classes of materials. In order to initially characterize the capabilities of the laser, a series of autogenous laser welds are made on flat plate samples machined from two refractory metals and two grades of austenitic stainless steels. The parametric studies performed on these materials are designed to measure the response of the laser welder to changes in input power and travel speed and to determine the maximum weld depth of which this system is capable in these materials. NTIS

*Continuous Wave Lasers; Diodes; Lasers; Refractory Metals; Stainless Steels; Welded Joints; Welding; Yag Lasers*

## 25

### INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

Includes the analysis, synthesis, and use of inorganic and organic compounds; combustion theory; electrochemistry; and photochemistry. For related information see category *34 Fluid Dynamics and Thermodynamics*. For astrochemistry see category *90 Astrophysics*.

**20060002831** Lawrence Livermore National Lab., Livermore, CA USA

**Testing Impact's Radiation Code**

Edis, T.; Cameron-Smith, P.; Grant, K. E.; Gergmann, D.; Chuang, C. C.; Jul. 2004; 28 pp.; In English

Report No.(s): DE2005-15014455; UCRL-TR-205281; No Copyright; Avail.: National Technical Information Service (NTIS)

This is a summary of work done over an 8 week period from May to July 2004, which concerned testing the longwave and shortwave radiation packages in Impact. The radiation code was initially developed primarily by Keith Grant in the context of LLNL's 2D model, and was added to Impact over the last few summers. While the radiation code had been tested and also used in some aerosol-related calculations, its 3D form in Impact had not been validated with comparisons to satellite data. Along with such comparisons, our work described here was also motivated by the need to validate the radiation code for use in the SciDAC consortium project. This involved getting the radiation code working with CAM/WACCM met data, and setting the stage for comparing CAM/WACCM radiation output with Impact results. A detailed description of the comparisons follows; another person looking to do similar work-which will be necessary in further phases of SciDAC- should be able to follow similar procedures.

NTIS

*Long Wave Radiation; Two Dimensional Models; Aerosols*

**20060002839** Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA

**Investigation of Oxide Layer Structure on Niobium Surfaces Using a Secondary Ion Mass Spectrometer**

Wu, A. T.; January 2005; 8 pp.; In English

Report No.(s): DE2005-850145; No Copyright; Avail.: National Technical Information Service (NTIS)

Oxide layer structure on the surfaces of niobium (Nb) can be studied by continuously monitoring peaks of the secondary ions of Nb and its relevant oxides as a function of time during depth profiling measurements employing a secondary ion mass spectrometer (SIMS). This is based on the fact that different oxides have different cracking patterns. This new approach is much simpler and easier for studying oxide layer structure on Nb surfaces than the conventional approach through deconvolution of oxide peaks obtained from an x-ray photoemission spectrometer. Eventually it can be developed into an in-situ tool for monitoring the oxide layer structure on Nb surfaces prepared by various procedures. Preliminary results of

SIMS measurements on the surfaces of Nb samples treated by buffered electropolishing and buffered chemical polishing will be reported.

NTIS

*Mass Spectrometers; Niobium; Oxides; Surface Properties*

**20060002875** California Univ., Davis, CA, USA

**Thermochemical Studies of Nitrides, Oxynitride, and Oxide Ceramic Materials.(Report for July 1, 1997-June 30, 2003)**

Jan. 2005; 12 pp.; In English

Report No.(s): DE2005-836058; No Copyright; Avail.: Department of Energy Information Bridge

The goals are: to develop high temperature oxide melt solution calorimetric techniques for a variety of nitrides and oxynitrides; to determine thermodynamics of silicon nitride and of ternary phases in rare earth oxide-silica-alumina-nitrogen systems relevant to silicon nitride processing, thermal barrier coatings, and other applications; to develop systematic understanding of the energetics of oxygen-nitrogen substitution, often coupled with altrivalent cation substitution, in a variety of oxynitride systems; and to measure enthalpies of formation of a number of binary and ternary nitrides, often containing transition metals, and to begin to develop a systematic understanding of structure-energy relations analogous to that developed for oxide compounds.

NTIS

*Ceramics; Nitrides; Oxides; Oxynitrides; Thermochemistry*

**20060002877** Ames Lab., IA, USA

**Center for Catalysis**

Kraus, G. A.; Apr. 2005; 8 pp.; In English

Report No.(s): DE2005-838426; No Copyright; Avail.: Department of Energy Information Bridge

The funds have been used to support proposals from interdisciplinary research teams in areas related to catalysis and green chemistry. The funds were used for seed projects. The summaries of research results are (1) photocatalytic heterogeneous oxidation of hydrocarbons; (2) oxidation and oxidative degradation; (3) catalytic conversion of corn fiber to hydrogen; (4) combinatorial development of homogeneous metal catalysts using molecular evolution; and (5) proposals based on the results have been submitted to funding agencies.

NTIS

*Catalysis; Environment Protection; Pollution Control*

**20060002962** Lawrence Livermore National Lab., Livermore, CA USA

**Microfluidic Tools for Biological Sample Preparation**

Visuri, S. R.; Ness, K.; Dzenitis, J.; Benett, B.; Bettencourt, K.; Apr. 10, 2002; 10 pp.; In English

Report No.(s): DE2005-15013423; UCRL-JC-147960; No Copyright; Avail.: Department of Energy Information Bridge

Researchers at Lawrence Livermore National Laboratory are developing means to collect and identify fluid-based biological pathogens in the forms of proteins, viruses, and bacteria. To support detection instruments, we are developing a flexible fluidic sample preparation unit. The overall goal of this Microfluidic Module is to input a fluid sample, containing background particulates and potentially target compounds, and deliver a processed sample for detection. We are developing techniques for sample purification, mixing, and filtration that would be useful to many applications including immunologic and nucleic acid assays. Sample preparation functions are accomplished with acoustic radiation pressure, dielectrophoresis, and solid phase extraction. We are integrating these technologies into packaged systems with pumps and valves to control fluid flow and investigating small-scale detection methods.

NTIS

*Microfluidic Devices; Pathogens*

**20060002989** Hughes Technical Center, Atlantic City International Airport, NJ, USA, SRA International, Inc., Egg Harbor Twp., NJ, USA

**Heats of Combustion of Brominated Epoxies**

Stoliarov, S. I.; Williams, Q.; Walters, R. N.; Crowley, S.; Lyon, R. E.; Nov. 2005; 20 pp.; In English

Report No.(s): PB2006-102393; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The widespread use of brominated flame retardants and fire extinguishing agents in aircraft cabins and recent concerns about their combustion toxicity and environmental impact prompted a study to understand the mechanism by which bromine

inhibits the flaming combustion of plastics as a first step towards identifying alternative chemicals or compounds. The heats of combustion of bromine-containing epoxies were calculated from the known atomic composition and compared to measured values in flaming and nonflaming combustion. The heat of flaming combustion was measured in a fire/cone calorimeter (CC) and by burning pyrolysis products in a methane laminar diffusion flame (pyrolysis-flaming combustion calorimetry (PFCC)). Heats of nonflaming combustion were measured by pyrolysis-combustion flow calorimetry (PCFC). The results of these tests indicate that the combustion heat released by these materials decreases with increasing amounts of brominated components as a result of incomplete combustion, char formation, and dilution of the materials with noncombustible bromine. Gas-phase combustion efficiency in the various test methods decreased as: PCFC > PFCC > CC.

NTIS

*Epoxy Resins; Flame Retardants; Flammability; Heat of Combustion; Bromine Compounds*

**20060003775** Australian Commonwealth Scientific and Research Organization, Hobart, Australia

#### **The CSIRO Method**

Clementson, Lesley; The Second SeaWiFS HPLC Analysis Round-Robin Experiment (SeaHARRE-2); August 2005; 3 pp.; In English; See also 20060003771; No Copyright; Avail.: CASI: [A01](#), Hardcopy

The HPLC method used by CSIRO is a modified version of the Wright et al. (1991) method. This method has the capacity to separate 50 different pigments and is used routinely in the CSIRO laboratory to separate approximately 35 different pigments, but does fail to separate monovinyl chlorophyll a and chlorophyll b from their divinyl forms. CSIRO has continued to use this method, because until recently, it was the recommended method of SIMBIOS (Mueller et al. 2003), and for many years the work of this laboratory has been in temperate waters for which the method works well. More recently, CSIRO has occasionally been working in tropical waters where divinyl chlorophyll a is often the predominant form of chlorophyll, and in these cases, the laboratory has started using the Zapata et al. (2000) method. For the SeaHARRE-2 activity, the Wright et al. (1991) method was used exclusively. Samples are extracted over 15-18 h in an acetone solution before analysis by HPLC using a reverse-phase C18 column and ternary gradient system with a photodiode array (PDA) detector. The method is regularly validated with the use of external standards and individual pigment calibration. The detection limit of most pigments is within the range of 0.001-0.005 mg m(sup-3). The method has proven to offer a good balance between accuracy of pigment composition and concentration and number of samples analyzed; an important factor in an applications based laboratory.

Author

*Chlorophylls; Chromophores; Pigments; Ternary Systems*

**20060003776** DHI Water and Environment, Horsholm, Denmark

#### **The DHI Method**

Schluter, Louise; The Second SeaWiFS HPLC Analysis Round-Robin Experiment (SeaHARRE-2); August 2005, pp. 1-2; In English; See also 20060003771; No Copyright; Avail.: CASI: [A01](#), Hardcopy

The HPLC method used at DHI is a slightly modified version of the method developed by Wright et al. (1991). This method does not separate chlorophyll c(sub 1) and chlorophyll c(sub 2); furthermore, divinyl chlorophylls a and b are not separated from monovinyl chlorophylls a and b, respectively. Dichromatic equations were used to separate divinyl chlorophyll a from monovinyl chlorophyll a (Latasa et al. 1996). The results of the dichromatic equations, however, showed in several instances that divinyl chlorophyll a was present although this pigment was not detected by the laboratories that were able to separate the two pigments chromatographically. The dichromatic equation method was apparently giving erroneous results, and should therefore be used with caution. Phaeophorbide a was not separated from fucoxanthin, but because these pigments have distinctly different absorption spectra, they could subsequently be separated.

Author

*Liquid Chromatography; Pigments; Methodology*

## **26**

### **METALS AND METALLIC MATERIALS**

Includes physical, chemical, and mechanical properties of metals and metallic materials; and metallurgy.

**20060002740** Lawrence Livermore National Lab., Livermore, CA USA

#### **Environmentally Assisted Cracking Behavior of Nickel Alloys in Simulated Acidic and Alkaline Ground Waters Using U-bend Specimens**

Fix, D. V.; Estill, J. C.; Hust, G. A.; Wong, L. L.; Rebak, R. B.; Oct. 17, 2003; 24 pp.; In English

Report No.(s): DE2005-15013848; UCRL-CONF-200360; No Copyright; Avail.: Department of Energy Information Bridge

The model for the degradation of the containers for nuclear waste includes three modes of corrosion, namely general corrosion, localized corrosion and environmentally assisted cracking (EAC). The objective of the current research was to quantify the susceptibility of five nickel alloys to EAC in several environmental conditions with varying solution composition, temperature and electrochemical potential. These alloys included: Alloy 22 (N06022), Alloy C-4 (N06455), Alloy 625 (N06625), Alloy G-3 (N06985) and Alloy 825 (N08825). The susceptibility to EAC was evaluated using constant deformation (deflection) U-bend specimens in both the non-welded (wrought) and welded conditions. Results show that after more than five years exposure in the vapor and liquid phases of alkaline (pH approx 10) and acidic (pH approx 3) multi-ionic environments at 60 deg C and 90 deg C, none of the tested alloys suffered environmentally assisted cracking.

NTIS

*Acidity; Ground Water; Nickel Alloys; Radiation Protection; U Bends*

**20060002741** Lawrence Livermore National Lab., Livermore, CA USA

**Enhancement of Strength and Ductility in Bulk Nanocrystalline Metals**

Nieh, T. G.; Schuh, C. A.; Caturla, M. J.; Hodge, A. M.; Feb. 24, 2004; 16 pp.; In English

Report No.(s): DE2005-15013859; UCRL-TR-202501; No Copyright; Avail.: Department of Energy Information Bridge

The purpose of this project is to develop a robust scientific and technological framework for the design of high-strength and -ductility nanocrystalline materials for applications of technical importance to the Laboratory. The project couples theory and experiments with an emphasis on materials of macroscopic dimensions (mm to cm) that are composed of nanoscale (<100 nm) grains. There are four major tasks: (1) synthesize nanocrystalline materials with grain size in the 5- to 100-nm range; (2) conduct experimental studies to probe mechanisms of mechanical deformation and failure; (3) use large-scale simulation modeling technologies to provide insight to deformation mechanisms that may not be observable experimentally; and (4) check the results obtained from modeling, comparing experimental observations with results obtained from atomistic and dislocation-based simulations.

NTIS

*Augmentation; Ductility; Metals*

**20060002820** Lawrence Livermore National Lab., Livermore, CA USA

**Interaction Between Titanium Implant Surfaces and Hydrogen Peroxide in Biologically Relevant Environments**

Muyco, J.; Ratto, T.; Orme, C.; Mckittrick, J.; Frangos, J.; Apr. 22, 2004; 12 pp.; In English

Report No.(s): DE2005-15014115; UCRL-PROC-203710; No Copyright; Avail.: Department of Energy Information Bridge

Titanium was exposed to dilute solutions of hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) to better characterize the interaction at the interface between the solution and metal. The intensity of light passing through films of known thickness of titanium on quartz was measured as a function of time in contact with H<sub>2</sub>O<sub>2</sub> in concentrations of 0.3% and 1.0%. An atomic force microscope (AFM) was used to record deflection-distance (force) curves as a probe approached the interface of titanium in contact with solution containing 0.3% of H<sub>2</sub>O<sub>2</sub>. The interaction layer measured using AFM techniques was much greater than the thickness of the titanium films used in this study. Raman spectroscopy taken during interaction shows the emergence of a Ti-peroxy gel and titania after 2 hours in contact with 0.3% H<sub>2</sub>O<sub>2</sub> solution.

NTIS

*Hydrogen Peroxide; Implantation; Metal Surfaces; Titanium*

**20060002867** Lawrence Livermore National Lab., Livermore, CA USA

**Use of EBSD Data in Mesoscale Numerical Analyses**

Becker, R.; Weiland, H.; Mar. 30, 2000; 24 pp.; In English

Report No.(s): DE2005-15013398; UCRL-JC-137195-REV-1; No Copyright; Avail.: Department of Energy Information Bridge

Experimentation, theory, and modeling have all played vital roles in defining what is known about microstructural evolution and the effects of microstructure on material properties. Recently, technology has become an enabling factor, allowing significant advances to be made on several fronts. Experimental evidence of crystallographic slip and the basic theory of crystal plasticity were established in the early 20th century, and the theory and models evolved incrementally over the next 60 years. During this time, modeling was primarily concerned with the average response of polycrystalline aggregates. While some detailed finite element modeling (FEM) with crystal plasticity constitutive relations was performed in the early 1980's such simulations over taxed the capacity of the available computer hardware. Advances in computer capabilities led to a flurry of activity in finite element modeling in the next 10 years, thus increasing understanding of lattice orientation evolution and

generating detailed predictions of spatial orientation distributions that could not be readily validated with existing experimental characterization methods.

NTIS

*Backscattering; Data Processing; Data Reduction; Mesoscale Phenomena; Numerical Analysis*

**20060002972** Lawrence Livermore National Lab., Livermore, CA USA

**High-Performance Corrosion-Resistant Materials: Iron-Based Amorphous-Metal Thermal-Spray Coatings**

Farmer, J. C.; Haslam, J. J.; Wong, F.; Ji, X.; Day, S. D.; Sep. 22, 2004; 204 pp.; In English

Report No.(s): DE2005-15011637; UCRL-TR-206717; No Copyright; Avail.: National Technical Information Service (NTIS)

The multi-institutional High Performance Corrosion Resistant Materials (HPCRM) Team is cosponsored by the Defense Advanced Projects Agency (DARPA) Defense Science Office (DSO) and the Department of Energy (DOE) Office of Civilian Radioactive Waste Management (OCRWM), and has developed new corrosion-resistant, iron-based amorphous metals that can be applied as coatings with advanced thermal spray technology. Two compositions have corrosion resistance superior to wrought nickel-based Alloy C-22 (UNS No. N06022) in very aggressive environments, including concentrated calcium-chloride brines at elevated temperature. Corrosion costs the Department of Defense billions of dollars every year, with an immense quantity of material in various structures undergoing corrosion.

NTIS

*Amorphous Materials; Corrosion Resistance; Iron; Metals; Sprayers*

**20060003009** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. All Other Miscellaneous Fabricated Metal Product Manufacturing**

Jan. 2005; 54 pp.; In English

Report No.(s): PB2006-103292; EC02-31I-332999(RV); No Copyright; Avail.: CASI: [A04](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nations economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in 2 and 7. The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions.

NTIS

*Census; Economic Analysis; Economics; Fabrication; Industries; Manufacturing*

**20060003027** Lawrence Livermore National Lab., Livermore, CA USA

**Low-Temperature Aging Behavior of U-6 wt Percent Nb**

Hsiung, L. L.; Feb. 04, 2005; 18 pp.; In English

Report No.(s): DE2005-15015897; UCRL-CONF-209428; No Copyright; Avail.: Department of Energy Information Bridge

Phase stability and aging mechanisms in a water-quenched (WQ) U-6wt% Nb (U-14at% Nb) alloy artificially aged at 200 degrees C and naturally aged at ambient temperature for 15 years have been investigated and studied using Vickers-hardness measurement, X-ray diffraction (XRD) analysis, and transmission electron microscopy (TEM) techniques. Age hardening/softening phenomenon is recorded from the artificially aged samples based upon the microhardness measurement. The age hardening can be readily rationalized by the occurrence of fine-scaled Nb segregation, or spinodal decomposition, within the (alpha) domains, which results in the formation of a modulated structure containing nano-scaled Nb-rich and Nb-lean domains. Prolonged aging leads to age softening of the alloy by coarsening of the modulated structure. Chemical ordering, or disorder-order phase transformation, is found within the naturally aged alloy according to TEM observations of antiphase domain boundaries (APBs) and superlattice diffraction patterns.

NTIS

*Stability; Aging (Materials); Low Temperature; Niobium*

**20060003039** Lawrence Livermore National Lab., Livermore, CA USA

**Characterization of Ti-6 Per Cent Al-4 Per Cent V and VasoMax C-350**

Sunwoo, A. J.; Apr. 21, 2005; 24 pp.; In English

Report No.(s): DE2005-15015902; UCRL-TR-211573; No Copyright; Avail.: National Technical Information Service (NTIS)

The (alpha)-(beta) Ti-6% Al-4% V (Ti64) alloy can be heat treated to meet the specified requirements of the applications. The as-received material from SLAC was given a solution heat treatment (SHT) to have a good strength and ductility combination. The SHT was done at 200 degrees C below the Beta transus of 990 degrees C for 15 min and air-cooled to 20 degrees C. The designed microstructure consists of (beta) phase precipitates within the (alpha) phase matrix. The characterization of the as-received Ti64 alloy sheet microstructure reveals equiaxed, 10 (micro)m-sized grains on the flat surface and finer, 8 (micro)m-sized grains in the through thickness. Figures 1 and 2 show the microstructure of the alloy. The typical Ti64 microstructure is lamellar structure, consisting of alternating (alpha) and (beta) phases. In order for the alloy to have the micron sized, equiaxed grains, it had to undergo extensive wrought processing. The Vicker's microhardness numbers (VHN) showed that the slightly larger grained flat surface had a higher averaged value than the through thickness; 33 kg/mm(sup 2) vs. 30 kg/mm(sup 2). The residual effect of wrought processing is still present even after the SHT to cause the small difference in the hardness values.

NTIS

*Aluminum Alloys; Heat Treatment; Heat of Solution*

## 27

### NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see *24 Composite Materials*.

**20060002746** Edison Welding Inst., Columbus, OH, USA

**Inspection of Fusion Joints in Plastic Pipe. (October 1, 2004-March 31, 2005)**

Savitsju, A.; Reichert, C.; Coffey, J.; Jul. 13, 2005; 40 pp.; In English

Report No.(s): DE2005-842206; No Copyright; Avail.: Department of Energy Information Bridge

The standard method of joining plastic pipe in the field is the butt fusion process. As in any pipeline application, joint quality greatly affects overall operational safety of the system. Currently no simple, reliable, cost effective method of assessing the quality of fusion joints in the field exists. Visual examination and pressure testing are current non-destructive testing, which do not provide any assurance about the long-term pipeline performance. This project will develop, demonstrate, and validate an in-situ non-destructive inspection method for butt fusion joints in gas distribution plastic pipelines. The inspection system will include a laser based image-recognition system that will automatically generate and interpret digital images of pipe joints and assign them a pass/fail rating, which eliminates operator bias in evaluating joint quality.

NTIS

*Inspection; Pipes (Tubes)*

**20060002804** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Inorganic Dye and Pigment Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-102974; EC02-31I-325131(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing inorganic dyes and pigments.

NTIS

*Census; Dyes; Economic Analysis; Economics; Industries; Manufacturing; Pigments*

**20060002805** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Synthetic Organic Dye and Pigment Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-102975; EC02-31I-325132(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing synthetic organic dyes and pigments, such as lakes and toners (except electrostatic and photographic).

NTIS

*Census; Dyes; Economic Analysis; Economics; Industries; Manufacturing; Pigments*

**20060002846** Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA

**Improved Fluid Handling Components for High Wear Applications in the Mining Industry. Final Technical Report. (Report for September 24, 2003 through September 24, 2004)**

January 2005; 38 pp.; In English

Report No.(s): DE2005-850170; No Copyright; Avail.: National Technical Information Service (NTIS)

In this program, Advanced Ceramics Research, Inc. (ACR) proposed to develop a process to fabricate abrasive fluid (such as ore slurries) handling components with ceramic liners that exhibit improved wear and friction properties when compared to metal or ceramic tile lined metal components currently in use. Currently available ceramic materials for these types of application were obtained from industry sources (CoorsTek and Abresist) and tested for wear resistance (using ASTM B-611) to establish a performance baseline for state of the art technologies. A process was then developed to produce cylindrical components with integral internal ceramic liners and an external metal shell. Ceramic liners were fabricated, using non-aqueous gel casting, from materials that were expected to have better wear resistance than the industry baseline materials.

NTIS

*Ceramics; Mining; Slurries; Wear; Wear Resistance*

**20060002874** Department of Energy, Washington, DC, USA

**Experimental Gas Cooled Reactor Creep Test. Agot Graphite**

Aug. 26, 1960; 18 pp.; In English

Report No.(s): DE2005-4102161; No Copyright; Avail.: Department of Energy Information Bridge

Tests were conducted to determine the cumulative and permanent deflection of a beam subjected to two-point loading for (1) ambient temperature-atmospheric environment, and (2) 800 degrees F-atmospheric environment, for 800 psi maximum flexural stresses. Deflection curves are given for five specimens. An analysis of the data indicated that if the core graphite creeps while at EGCR conditions by approximately 1.5 times its creep rate at ambient temperature, the stresses will level off below 1000 psi. Considerable oxidation occurred for two specimens at 800 degrees F. The indicated strain of these specimens may not be representative of AGOT, nuclear grade graphite at 800 degrees F in an inert atmosphere.

NTIS

*Creep Tests; Gas Cooled Reactors; Graphite*

**20060002881** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Plastics Plumbing Fixture Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-103001; EC02-31I-326191(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The

economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing plastics or fiberglass plumbing fixtures. Examples of products made by these establishments are plastics or fiberglass bathtubs, hot tubs, portable toilets, and shower stalls.

NTIS

*Census; Economic Analysis; Economics; Fixtures; Fluid Flow; Industries; Manufacturing; Pipelines; Plastics*

**20060002882** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Plastics Bottle Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-103000; EC02-31I-326160(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing plastics bottles.

NTIS

*Bottles; Census; Economic Analysis; Economics; Industries; Manufacturing; Plastics*

**20060002883** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Tire Manufacturing (Except Retreading)**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-103003; EC02-31I-326211(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing tires and inner tubes from natural and synthetic rubber.

NTIS

*Census; Economic Analysis; Economics; Industries; Manufacturing; Tires*

**20060002884** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Tire Retreading**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-103004; EC02-31I-326212(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product

estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in retreading or rebuilding tires.

NTIS

*Census; Economic Analysis; Economics; Industries; Manufacturing; Tires*

**20060002885** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Synthetic Rubber Manufacturing**

Jan. 2005; 50 pp.; In English

Report No.(s): PB2006-102982; EC02-31I-325212(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry consists of establishments primarily engaged in manufacturing synthetic rubber.

NTIS

*Census; Economic Analysis; Economics; Industries; Manufacturing; Rubber; Synthetic Rubbers*

**20060002887** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Printing Ink Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-102990; EC02-31I-325910(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing printing and inkjet inks and inkjet cartridges.

NTIS

*Census; Coal; Economic Analysis; Economics; Industries; Inks; Manufacturing; Printing*

**20060002888** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Rubber and Plastics Hoses and Belting Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-103005; EC02-31I-326220(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These

reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing rubber hose and/or plastics (reinforced) hose and belting from natural and synthetic rubber and/or plastics resins. Establishments manufacturing garden hoses from purchased hose are included in this industry.

NTIS

*Census; Economic Analysis; Economics; Hoses; Industries; Manufacturing; Plastics; Rubber*

**20060002889** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Rubber Product Manufacturing for Mechanical Use**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-103006; EC02-31I-326291(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in molding, extruding, or lathecutting rubber to manufacture rubber goods (except tubing) for mechanical applications. Products of this industry are generally parts for motor vehicles, machinery, and equipment.

NTIS

*Census; Economic Analysis; Economics; Industries; Manufacturing; Rubber*

**20060002890** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Vitreous China Plumbing Fixture and China and Earthenware Bathroom Accessories Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-103007; EC02-31I-327111(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing vitreous china plumbing fixtures and china and earthenware bathroom accessories, such as faucet handles, towel bars, and soap dishes.

NTIS

*Census; China; Economic Analysis; Economics; Fixtures; Fluid Flow; Industries; Manufacturing; Pipelines*

**20060002891** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Custom Compounding of Purchased Resin**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-102992; EC02-31I-325991(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191,

and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry group comprises establishments primarily engaged in one or more of the following: 1. custom mixing and blending plastics resins made elsewhere, or 2. reformulating plastics resins from recycled plastics products.

NTIS

*Census; Compounding; Economic Analysis; Economics; Industries; Manufacturing; Resins*

**20060002892** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Vitreous China, Fine Earthenware, and Other Pottery Product Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-103008; EC02-31I-327112(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing table and kitchen articles, art and ornamental items, and similar vitreous china, fine earthenware, stoneware, coarse earthenware, and pottery products.

NTIS

*Census; China; Economic Analysis; Economics; Industries; Manufacturing*

**20060002893** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Porcelain Electrical Supply Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-103009; EC02-31I-327113(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing porcelain electrical insulators, molded porcelain parts for electrical devices, ferrite or ceramic magnets, and electronic and electrical supplies from nonmetallic minerals, such as clay and ceramic materials.

NTIS

*Census; Economic Analysis; Economics; Industries; Manufacturing; Porcelain; Supplying*

**20060002894** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Brick and Structural Clay Tile Manufacturing**

Jan. 2005; 50 pp.; In English

Report No.(s): PB2006-103010; EC02-31I-327121(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing brick and structural clay tiles.

NTIS

*Bricks; Census; Clays; Economic Analysis; Economics; Industries; Manufacturing; Tiles*

**20060002900** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Other Structural Clay Product Manufacturing**

Jan. 2005; 50 pp.; In English

Report No.(s): PB2006-103012; EC02-31I-327123(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing clay sewer pipe, drain tile, flue lining tile, architectural terra-cotta, and other structural clay products.

NTIS

*Census; Clays; Economic Analysis; Economics; Industries; Manufacturing*

**20060002904** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Ceramic Wall and Floor Tile Manufacturing**

Jan. 2005; 50 pp.; In English

Report No.(s): PB2006-103011; EC02-31I-327122(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing ceramic wall and floor tiles.

NTIS

*Census; Ceramics; Economic Analysis; Economics; Floors; Industries; Manufacturing; Tiles; Walls*

**20060002905** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Clay Refractory Manufacturing**

Jan. 2005; 50 pp.; In English

Report No.(s): PB2006-103013; EC02-31I-327124(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides

essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing clay refractory, mortar, brick, block, tile, and fabricated clay refractories, such as melting pots. A refractory is a material that will retain its shape and chemical identity when subjected to high temperatures and is used in applications that require extreme resistance to heat, such as furnace linings.

NTIS

*Census; Clays; Economic Analysis; Economics; Industries; Manufacturing; Refractories*

**20060002908** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Carbon Black Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-102977; EC02-31I-325182(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing carbon black, bone black, and lamp black.

NTIS

*Carbon; Census; Economic Analysis; Economics; Industries; Manufacturing*

**20060002911** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Plastics Material and Resin Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-102981; EC02-31I-325211(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in: 1. manufacturing resins, plastics materials, and nonvulcanizable thermoplastic elastomers and mixing and blending resins on a custom basis, and/or 2. manufacturing noncustomized synthetic resins.

NTIS

*Census; Economic Analysis; Economics; Industries; Manufacturing; Plastics; Resins*

**20060002919** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Plastics Packaging Film and Sheet (Including Laminated) Manufacturing**

May 2005; 50 pp.; In English

Report No.(s): PB2006-102995; EC02-31I-326112(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in converting plastics resins into plastics packaging (flexible) film and packaging sheet.

NTIS

*Census; Economic Analysis; Economics; Industries; Laminates; Manufacturing; Packaging; Plastics*

**20060002920** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Plastic Bag Manufacturing**

May 2005; 50 pp.; In English

Report No.(s): PB2006-102994; EC02-31I-326111(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry group comprises establishments primarily engaged in one of the following: 1. converting plastics resins into plastics bags or 2. forming, coating, or laminating plastics film and sheet into single wall or multiwall plastics bags. Establishments in this industry may print on the bags they manufacture.

NTIS

*Bags; Census; Economic Analysis; Economics; Industries; Manufacturing; Plastics*

**20060002921** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Unlaminated Plastics Profile Shape Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-102997; EC02-31I-326121(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in converting plastics resins into nonrigid plastics profile shapes (except film, sheet, and bags), such as rod, tube, and sausage casings.

NTIS

*Census; Economic Analysis; Economics; Industries; Manufacturing; Plastics; Shapes*

**20060002922** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Plastics Pipe and Pipe Fitting Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-102998; EC02-31I-326122(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in converting plastics resins into rigid plastics pipes and pipe fittings.

NTIS

*Census; Economic Analysis; Economics; Fitting; Fittings; Industries; Manufacturing; Pipes (Tubes); Plastics*

**20060002923**

**Economic Census 2002: Manufacturing, Industry Series. Unlaminated Plastics Film and Sheet (Except Packaging) Manufacturing**

May 2005; 50 pp.; In English

Report No.(s): PB2006-102996; EC02-31I-326113(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change in the following reports. This U.S. industry comprises establishments primarily engaged in converting plastics resins into plastics film and unlaminated sheet (except packaging).

NTIS

*Census; Economic Analysis; Economics; Industries; Manufacturing; Packaging; Plastics*

**20060002942** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Carbon and Graphite Product Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-103390; EC02-31I-335991(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing carbon, graphite, and metal-graphite brushes and brush stock; carbon or graphite electrodes for thermal and electrolytic uses; carbon and graphite fibers; and other carbon, graphite, and metal-graphite products.

NTIS

*Carbon; Census; Economic Analysis; Economics; Graphite; Industries; Manufacturing*

**20060002950** Lawrence Livermore National Lab., Livermore, CA USA

**High-Temperature Studies of Glass Dissolution Rates Close to Saturation**

Zavarin, M.; Roberts, S. K.; Zhao, P.; Williams, R. W.; Rose, T. P.; Feb. 2004; 46 pp.; In English

Report No.(s): DE2005-15014327; UCRL-TR-204874; No Copyright; Avail.: National Technical Information Service (NTIS)

Most long-lived radionuclides associated with an underground nuclear test are incorporated into a melt glass and are released by glass dissolution to become part of the hydrologic source term (HST). Although the rates of rhyolite glass dissolution are well known under conditions where the fluid is far from saturation with respect to glass, the rates are not well known under conditions where the fluid approaches saturation. These rates are commonly much lower than the far-from-saturation rates, often by a factor greater than 100. In recent HST simulations, we conservatively estimated steady-state release rates based on a far-from-saturation fluid conditions. In recent CHESHIRE near-field simulations, it was predicted that approximately 30% of the nuclear melt glass dissolved over 1000 years. Although the far-from-saturation rate approach provides a conservative estimate of glass dissolution, it may greatly overestimate the rates of melt glass dissolution. At CHESHIRE, less conservative estimates suggest that only approximately 1% of the nuclear melt glass will dissolve in 1000 years. Lower glass dissolution rates result in lower radionuclide release rates from nuclear melt glass.

NTIS

*Dissolving; Glass; High Temperature; Precipitation (Chemistry)*

**20060002971** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Nonclay Refractory Manufacturing**

Jan. 2005; 50 pp.; In English

Report No.(s): PB2006-103014; EC02-31I-327125(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing nonclay refractory, mortar, brick, block, tile, and fabricated nonclay refractories such as graphite, magnesite, silica, or alumina crucibles. A refractory is a material that will retain its shape and chemical identity when subjected to high temperatures and is used in applications that require extreme resistance to heat, such as furnace linings.

NTIS

*Census; Economic Analysis; Economics; Industries; Manufacturing; Refractories*

**20060002979** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Flat Glass Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-103015; EC02-31I-327211(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in 1. manufacturing flat glass by melting silica sand or cullet or 2. manufacturing both flat glass and laminated glass by melting silica sand or cullet.

NTIS

*Census; Economic Analysis; Economics; Glass; Industries; Manufacturing*

**20060002980** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Other Pressed and Blown Glass and Glassware Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-103016; EC02-31I-327212(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing glass by melting silica sand or cullet and making pressed, blown, or shaped glass or glassware (except glass packaging containers).

NTIS

*Census; Economic Analysis; Economics; Glass; Glassware; Industries; Manufacturing*

**20060002982** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Glass Container Manufacturing**

Jan. 2005; 50 pp.; In English

Report No.(s): PB2006-103017; EC02-31I-327213(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing glass packaging containers.

NTIS

*Census; Economic Analysis; Economics; Glass; Industries; Manufacturing*

**20060002984** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Glass Product Manufacturing Made of Purchased Glass**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-103018; EC02-31I-327215(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change in the following reports. This U.S. industry comprises establishments primarily engaged in coating, laminating, tempering, or shaping purchased glass.

NTIS

*Census; Economic Analysis; Economics; Glass; Industries; Manufacturing*

**20060002988** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Laminated Plastics Plate, Sheet (Except Packaging), and Shape Manufacturing**

May 2005; 50 pp.; In English

Report No.(s): PB2006-102999; EC02-31I-326130(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in laminating plastics profile shapes such as plate, sheet (except packaging), and rod. The lamination process generally involves bonding or impregnating profiles with plastics resins and compressing them under heat.

NTIS

*Census; Economic Analysis; Economics; Industries; Laminates; Manufacturing; Packaging; Plastics; Plates (Structural Members); Shapes*

**20060003000** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Paint and Coating Manufacturing**

Feb. 2005; 52 pp.; In English

Report No.(s): PB2006-103046; EC02-31I-325510(RV); No Copyright; Avail.: CASI: [A04](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in: 1. mixing pigments, solvents, and binders into paints and other coatings, such as stains, varnishes, lacquers, enamels, shellacs, and water repellant coatings for concrete and masonry and/or 2. manufacturing allied paint products, such as putties, paint and varnish removers, paint brush cleaners, and frit.

NTIS

*Census; Coating; Economic Analysis; Economics; Industries; Manufacturing; Paints*

**20060003003** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. All Other Rubber Product Manufacturing**

Dec. 2004; 52 pp.; In English

Report No.(s): PB2006-103053; EC02-31I-326299(RV); No Copyright; Avail.: CASI: [A04](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing rubber products (except tires; hoses and belting; and molded,

extruded, and lathe-cut rubber goods for mechanical applications) from natural and synthetic rubber.

NTIS

*Census; Economic Analysis; Economics; Industries; Manufacturing; Rubber*

**20060003005** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. All Other Plastics Product Manufacturing**

Dec. 2004; 56 pp.; In English

Report No.(s): PB2006-103059; EC02-31I-326199(RV); No Copyright; Avail.: CASI: [A04](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing plastics products (except film, sheet, bags, profile shapes, pipes, pipe fittings, laminates, foam products, bottles, plumbing fixtures, and resilient floor coverings).

NTIS

*Census; Economic Analysis; Economics; Industries; Manufacturing; Plastics*

**20060003015** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Plastics and Rubber Industry Machinery Manufacturing**

Jan. 2005; 54 pp.; In English

Report No.(s): PB2006-103297; EC02-31I-333220(RV); No Copyright; Avail.: CASI: [A04](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nations economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in 2 and 7. The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions.

NTIS

*Census; Economic Analysis; Economics; Industries; Manufacturing; Plastics; Rubber*

**20060003028** Florida Univ., Gainesville, FL, USA

**Evaluation of Shrinkage Cracking Potential of Concrete Used in Bridge Decks in Florida**

Tia, M.; Subramanian, R.; Brown, D.; Broward, C.; Sep. 2005; 146 pp.; In English

Contract(s)/Grant(s): BC-354-RPWO-26

Report No.(s): PB2006-102383; UF-4910-4504-797-12; No Copyright; Avail.: National Technical Information Service (NTIS)

The main objectives of this research are: (1) to develop an effective and convenient laboratory set-up and procedure for evaluation concrete mixtures for their resistance to shrinkage cracking in service, (2) to evaluate the different concrete mixtures that have various different admixtures added for reducing the shrinkage in the concrete, and (3) to make recommendations for concrete mix designs for improved resistance to shrinkage cracking in service.

NTIS

*Concretes; Fracturing; Shrinkage*

**20060003038** Lawrence Livermore National Lab., Livermore, CA USA

**LS&T and CMS FY 2004 Feasibility Proposal 04-FS-006-Ceramic Laser Materials Interim Report June 8, 2004**

Soules, T.; Clapsaddle, B.; Schaffers, K.; Ledingham, R.; Feb. 07, 2005; 16 pp.; In English

Report No.(s): DE2005-15011560; UCRL-TR-209484; No Copyright; Avail.: Department of Energy Information Bridge

The purpose of this memo is to give an update on our work on ceramic laser materials--feasibility proposal 04-FS-006. Transparent ceramic materials have several major advantages over single crystals in laser applications including ease and

robustness of manufacturing, large apertures, design flexibility, fracture toughness, high activator concentrations, uniformity of composition, no residual stress, and others discussed in the proposal. After a decade of working on making transparent YAG:Nd in 1995 Japanese workers demonstrated samples for the first time that performed as well in lasers as their single crystal counterparts. Since then several laser materials have been made and evaluated. For these reasons, developing ceramic laser materials is the most exciting and futuristic materials topic in today's major solid-state laser conferences.

NTIS

*Ceramics; Feasibility; Laser Materials*

## 28

### PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; their storage and handling procedures; and aircraft fuels. For nuclear fuels see 73 *Nuclear Physics*. For related information see also 07 *Aircraft Propulsion and Power*; 20 *Spacecraft Propulsion and Power*; and 44 *Energy Production and Conversion*.

**20060002815** North Carolina State Univ., Raleigh, NC, USA, Clemson Univ., SC, USA, Louisiana State Univ., Baton Rouge, LA, USA

#### **Reformulation of Coal-Derived Transportation Fuels: Selective Oxidation of Carbon Monoxide on Metal Foam Catalysts**

Chin, P.; Sun, X.; Roberts, G. W.; Sirijarhuphan, A.; Pansare, S.; January 2005; 28 pp.; In English

Report No.(s): DE2005-843092; No Copyright; Avail.: National Technical Information Service (NTIS)

Hydrocarbon fuels must be reformed in a series of steps to provide hydrogen for use in proton exchange membrane fuel cells (PEMFCs). Preferential oxidation (PROX) is one method to reduce the CO concentration to less than 10 ppm in the presence of approx. 40% H<sub>2</sub>, CO<sub>2</sub>, and steam. This will prevent CO poisoning of the PEMFC anode. Structured supports, such as ceramic monoliths, can be used for the PROX reaction. Alternatively, metal foams offer a number of advantages over the traditional ceramic monolith. Reaction studies were conducted on catalyzed structured supports using a fixed bed adiabatic reactor with an online non-dispersive IR gas analyzer. Scanning electron microscopy (SEM) and catalyst cycling experiments were conducted to characterize the washcoats. Thermal and mechanical cycling did not cause an appreciable loss of washcoat from a metal foam. The SEM images of catalyzed metal foams revealed a heterogeneous washcoat thickness and an inconsistent wash deposition. Qualitatively, no distinct differences were seen between virgin and 'used' metal foams or metal foams with different pores per inch and densities. The SEM images of catalyzed ceramic monoliths revealed a more uniform washcoat compared to metal foams. The focus of recent work has been catalyst characterization, specifically SEM and catalyst cycling, of the supports. The results are summarized here: SEM images of catalyzed metal foams reveal a heterogeneous washcoat thickness and an inconsistent washcoat deposition. Qualitatively, no distinct differences are seen between virgin and 'used' metal foams or metal foams with different ppi and densities; SEM images of catalyzed ceramic monoliths reveal a more uniform washcoat compared to metal foams; and thermal and mechanical cycling did not remove an appreciable amount of washcoat on a metal foam.

NTIS

*Carbon Monoxide; Catalysts; Fuels; Metal Foams; Oxidation; Transportation; Catalysis; Fuel Cells; Steam*

## 31

### ENGINEERING (GENERAL)

Includes general research topics related to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention. For specific topics in engineering see *categories 32 through 39*.

**20060003060** McMaster Univ., Hamilton, Ontario, Canada

#### **On the Use of X2-Test in Signal Detection**

Zhang, Q. T.; Yip, P.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 26.8.1 - 26.8.4; In English; See also 20060003045

Contract(s)/Grant(s): NSERC-A3635; Copyright; Avail.: Other Sources

The problem considered in this work is the detection of a random signal in colored noise. A modelling approach was used to construct two hypotheses: that the received data consisted of noise alone (hypothesis H<sub>0</sub>) and that they consisted of signal plus noise (hypothesis H<sub>1</sub>). The models used were linear auto-regressive models. A log likelihood ratio was constructed, based on these hypothesis. The probability density of this ratio was approximated by a  $\chi^2$  - distribution,

from where the threshold levels for the detector under a given probability of detection could be estimated. Computer simulations showed that the x2-approximation provided a good basis for threshold estimation. good detection performance was also verified.

Author

*Computerized Simulation; Random Signals; Signal Detection*

**20060003171** Carleton Univ., Ottawa, Ontario, Canada

**Algorithm Selection and Software Time/Space Optimization for a DSP Micro-Based Speech Processor For a Multi-Electrode Cochlear Implant**

Morris, L. Robert; Barazczewski, Peter; Bosley, Jonathan; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 22B4.1 - 22B4.4; In English; See also 20060003045

Contract(s)/Grant(s): MRC-PG-13; SRC-A7781; Copyright; Avail.: Other Sources

Selection of appropriate algorithms for pitch formant extraction, in conjunction with use of innovative programming techniques, enables these speech-related features to be derived in real-time a low-power TMS 320C10 based-system using about of that chip's computing power. Moreover, si\_e based techniques are used, an accurate low-o - model of the vocal system is inherent in the parameters extracted. This programmable system provides a flexible foundation for exploring utility of other fundamental speech features addition to pitch and formants for excitation of cochlear prosthesis.

Author

*Algorithms; Speech Recognition*

**20060003679** Yokohama National Univ., Japan

**An Effect of a Limit Cycle on an Output Signal**

Kato, Masafumi; Ishil Rokuya; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1041-1044; In English; See also 20060003631

Contract(s)/Grant(s): MOE 00435013; MOE 00535012; Copyright; Avail.: Other Sources

An effect of limit cycles on an output signal is studied in a second order digital filter when an input signal is sinusoidal. Firstly, the value  $l$  which represents the effect of limit cycles is defined. Then, the value  $l$  can be calculated theoretically in some regions. In other regions, an upper bound of  $l$  are derived. The upper bound is compared with an obtained  $l$  by simulations. Further, the random rounding as an elimination method of a limit cycle is studied by using  $l$ .

Author

*Cycles; Digital Filters; Signals*

**20060003685** Purdue Univ., West Lafayette, IN, USA

**DC Fault Diagnosis Using Complementary Pivot Theory**

Pen-min, Lin; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1132-1135; In English; See also 20060003631; Copyright; Avail.: Other Sources

This paper describes the application of complementary pivot theory in dc fault diagnosis of analog circuits. Besides a faster dc analysis, one important advantage of the present approach is the possibility to establish a data base so that the fault dictionary can be expanded without resorting an analog circuit simulator such as SYSCAP or SPICE2.

Author

*Direct Current; Analog Circuits; Diagnosis*

## 32

### COMMUNICATIONS AND RADAR

Includes radar; radio, wire, and optical communications; land and global communications; communications theory. For related information see also 04 Aircraft Communications and Navigation; and 17 Space Communications, Spacecraft Communications, Command and Tracking; for search and rescue, see 03 Air Transportation and Safety, and 16 Space Transportation and Safety.

**20060002826** Lawrence Livermore National Lab., Livermore, CA USA

**Scalable Analysis Techniques for Microprocessor Performance Counter Metrics**

Ahn, D. H.; Vetter, J. S.; Jul. 24, 2002; 18 pp.; In English

Report No.(s): DE2005-15013340; UCRL-JC-148058; No Copyright; Avail.: Department of Energy Information Bridge

Contemporary microprocessors provide a rich set of integrated performance counters that allow application developers

and system architects alike the opportunity to gather important information about workload behaviors. These counters can capture instruction, memory, and operating system behaviors. Current techniques for analyzing data produced from these counters use raw counts, ratios, and visualization techniques to help users make decisions about their application source code. While these techniques are appropriate for analyzing data from one process, they do not scale easily to new levels demanded by contemporary computing systems. Indeed, the amount of data generated by these experiments is on the order of tens of thousands of data points. Furthermore, if users execute multiple experiments, then we add yet another dimension to this already knotty picture. This flood of multidimensional data can swamp efforts to harvest important ideas from these valuable counters. Very simply, this paper addresses these concerns by evaluating several multivariate statistical techniques on these datasets. We find that several techniques, such as statistical clustering, can automatically extract important features from this data. These derived results can, in turn, be feed directly back to an application developer, or used as input to a more comprehensive performance analysis environment, such as a visualization or an expert system.

NTIS

*Computer Networks; Counters; Microprocessors; Statistical Analysis; Memory (Computers)*

**20060002930** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Switchgear and Switchboard Apparatus Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-103382; EC02-31I-335313(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing switchgear and switchboard apparatus.

NTIS

*Census; Economic Analysis; Economics; Industries; Manufacturing*

**20060002937** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Other Communication and Energy Wire Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-103387; EC02-31I-335929(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing insulated wire and cable of nonferrous metals from purchased wire.

NTIS

*Census; Communication Equipment; Economic Analysis; Economics; Industries; Manufacturing; Wire*

**20060002940** Swedish Defence Research Establishment, Linköping, Sweden

**UIntelligibility of Simultaneous Radiocommunication**

Carlander, O.; Kindstroem, M.; Dec. 2004; 28 pp.; In Swedish

Report No.(s): PB2006-100613; FOI-R-1525-SE; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A command operator of fire and rescue units needs to pay attention to several simultaneous streams of radio voices to optimize information gathering for the coordination of simultaneous emergency missions. An experiment investigated command operator ability to discern stereo and 3D-audio call-signs presented in background noise of added voice sources. Each of 10 command operators listened to 1 to 4 call-signs combined with 2 to 4 background voices with the primary task to identify to speaker of each call-sign. A secondary visual and manual-response task was used to induce an overall heightened mental workload situation. 3D-audio presentation resulted in a slightly increased number of correctly indicated locations of call-signs. Four background voices reduced correctness compared to sets of 1 and 2 call-signs, respectively. The results are discussed in relation to the potential for improving 3D-audio presentation and intelligibility, and its possible impact on operator effectiveness.

NTIS

*Intelligibility; Telecommunication*

**20060003056** Hokkaido Univ., Sapporo, Japan

**A Lattice Filter Model with Accurate Lip Impedance for Dynamic Articulatory Movement**

Miki, Nobuhiro; Motoki, Kunitoshi; Nagai, Nobuo; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 22A4.1 - 22A4.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

In the vocal tract model, the area function of vocal tracts is accurately represented by a polynomial function with a few parameters, and the digital filter realization includes the loss, the accurate lip impedance and the variation of the tract length. We measured the lip impedance using a manikin and pipes set in a baffle, and obtained the reflection coefficient at the lips. From the results of these experiments, we discuss the difference between the measured characteristics and those of a spherical baffle model, and show a method to obtain approximate digital filters for the reflection characteristics at the end of the vocal-tract; i.e. the lips. By introducing this filter, it becomes possible to express arbitrary changes of the length of the vocal-tract without changing the sampling frequency.

Author

*Digital Filters; Impedance; Baffles*

**20060003059** Bell Telephone Labs., Inc., Holmdel, NJ, USA

**An Efficient Block Matching Algorithm for Motion-Compensated Coding**

Puri, A.; Hang, H.-M.; Schilling, D. L.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 25.4.1 - 25.4.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

We present an efficient search technique which minimizes the computations necessary for estimating the motion in video-sequences by the block matching method. We also discuss the theoretical basis for conducting such a reduced search by our technique. We then present two algorithms which employ the proposed technique for estimating the motion typical of videoconferencing environment. Next, the results of computer simulations on a real video-sequence are included which demonstrate the effectiveness of the proposed technique. Finally, the results of a study of statistical properties of block motion-compensated frame difference signals are also summarized, to assist in future choice of a coding strategy for such signals.

Author

*Algorithms; Computerized Simulation; Video Communication*

**20060003084** Queensland Inst. of Tech., Brisbane, Australia

**Implementation of State-Space Digital Filter Structures Using Block Floating Point Arithmetic**

Sridharan, S.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 908-911; In English; See also 20060003045; Copyright; Avail.: Other Sources

Block floating-point arithmetic is considered as an alternative to fixed-point and floating-point arithmetic in the implementation of recursive digital filters. Block floating-point implementation of state-space digital structures is shown to have improved signal-to-noise ratio compared to fixed-point implementation and can be designed to be free of over flow. It is shown that the filter cannot support zero input limit cycle oscillations of period higher than one. An architecture suitable for the VLSI implementation of a block floating point co-processor is described.

Author

*Floating Point Arithmetic; IIR Filters; Spacecraft Structures*

**20060003090** BBN Systems and Technologies Corp., Cambridge, MA, USA

**A Single Board Multirate APC Speech Coding Terminal**

Field, K.; Derr, A.; Cosell, L.; Henry, C.; Krasner, M.; Tiao, J.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 960-963; In English; See also 20060003045; Copyright; Avail.: Other Sources

A single-board 16 kb/s and 32 kb/s APC speech coding terminal is described. The board is configurable as either two receivers, two transmitters, or a single-channel full-duplex coder. The terminal consists of two identical, independent TI TMS32020- based modules. Included in each module is a TMS32020, an analog I/O section, ND/A conversion, digital I/O circuitry, static RAMs, and EPROMs. The board size is 5.6 in. x 6.0 in., and can be packaged in a standard secretarial desk phone shell. A software architecture using this hardware to implement the 16/32 kb/s Adaptive Predictive Coding with Hybrid Quantization (APCHQ) algorithm is described.

Author

*Voice Data Processing; Speech Recognition; Algorithms*

**20060003100** Bell Telephone Labs., Inc., Morristown, NJ, USA

**Statistical Features versus Word Templates for Speaker Independent Digit Recognition over Long Distance Telephone Connections**

Bocchieri, Enrico L.; Doddington, George R.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 27.7.1 - 27.1.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

We extend to speaker independent recognition of isolated digits over long distance telephone connections (from the FAA telephone speech data base) the use of frame-specific statistical features that have already been tested on a studio-quality data base (Texas Instruments isolated digit data base). In addition, for both the telephone and the studio-quality data bases, we compare recognition performance of frame-specific statistical models versus pattern matching of the input speech with multiple templates of the vocabulary digits. When testing is performed on the more difficult long distance telephone data base, the performance of frame-specific distance measures (3.6% substitution rate) is superior to pattern matching with multiple templates (6.8% substitution rate).

Author

*Digits; Templates; Words (Language); Data Bases*

**20060003103** California State Univ., Long Beach, CA, USA

**Adaptive Noise Cancellation for Speech with a TMS32020**

Hen Geul, Yeh; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 1171-1174; In English; See also 20060003045; Copyright; Avail.: Other Sources

The noise cancellation using an adaptive filtering technique for speech signal is experimentally studied with a TMS32020 digital signal processor. The LMS algorithm is employed in the implementation of an adaptive filter due to its simplicity and ease of computation. The TMS32020 digital signal processor is suited for the implementation since it has the capability and features to implement all of the required function with full precision. The transversal filter structure is selected due to its simplicity and ease of coding.

Author

*Cancellation; Digital Systems; Signal Analyzers; Signal Processing*

**20060003107** North Carolina State Univ., Raleigh, NC, USA

**Consistency of the Minimum Mean Square Error Estimate**

Trussell, H. Joel; Civanlar, M. Reha; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 1213-1216; In English; See also 20060003045; Copyright; Avail.: Other Sources

The minimum mean square error estimate for the deconvolution problem of a Gaussian signal in Gaussian noise is shown to be feasible in the sense of being inside closed convex sets defined by the noise statistics. It is pointed out that there is some a priori knowledge which is not satisfied by the Wiener solution but the set formed by this information is not convex.

Author

*Random Noise; Mean Square Values; Error Analysis; Consistency*

**20060003108** State Univ. of New York, Buffalo, NY, USA

**Reconstruction of Bandlimited Signals from Their Unevenly-Spaced Sampled Data**

Soumekh, M.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 28.12.1 - 28.12.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

This paper addresses the problem of reconstructing a bandlimited signal from a finite number of its unevenly spaced sampled data. We present the main results for a Fourier analysis of the available data [10] done in a framework similar to Shannon's sampling theorem for evenly spaced data. The results are then utilized to determine the required constraints and algorithms for accurate reconstruction.

Author

*Signal Processing; Sampled Data Systems; Reconstruction*

**20060003110** Illinois Univ., Urbana, IL, USA

**Extrapolation of Multi-Dimensional Bandlimited Sequences Using Energy Concentration Information**

Potter, L. C.; Arun, K. S.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 27.17.1 - 28.17.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

This paper presents a new algorithm for the extrapolation of multidimensional bandlimited sequences. The new algorithm is capable of incorporating prior knowledge of the concentration of signal energy on a finite region and imposes no restriction on either the location of observations from the multidimensional signal to be extrapolated or the shape of its passband.

Author

*Extrapolation; Tomography; Sequencing*

**20060003111** Arkansas Univ., Fayetteville, AR, USA

**A Minimum Risk Quantizer for Noisy Sources**

Cook, Mark K.; Jones, Richard A.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 28.20.1 - 28.20.3; In English; See also 20060003045

Contract(s)/Grant(s): AFOSR-84-0322; Copyright; Avail.: Other Sources

The problem of quantizing noisy signals in an optimal manner is addressed. Quantizer designs relying on training sets, 'clean' probability statistics, or composite statistics of source and noise, will yield designs which are sub-optimal and possibly detrimental to system performance. The concept of the quantizer as an estimator is used in conjunction with a risk function to produce a minimum risk quantizer for noisy sources. In particular, the minimum-risk quantizer design theory for the case of independent, identically distributed source with additive (i.i.d.) noise is developed. The minimum-risk quantizer criteria for the specific problem of a source signal with gaussian statistics corrupted by additive gaussian noise and the squared-error cost function is produced. It is further shown that the Max-Lloyd optimal quantizer criteria is a subset of the minimum-risk criteria for noiseless conditions.

Author

*Probability Theory; Counters; Signal Processing*

**20060003169** Bell Telephone Labs., Inc., Murray Hill, NJ, USA

**A Family of ADPCM Coders Implemented on Real-Time Hardware**

Cox, Richard V.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 22B2.1- 22B2.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

Recently, work in ADPCM speech coding has focused on using the adaptive predictors, already included in the coder algorithm, as the basis for noise shaping and post-filtering. This technique is based on improving the perceived quality of the signal -- no actual improvement in signal-to-noise ratio is possible. The original work was performed with an intended application of improving the performance of 16 and 24 kbps ADPCM. We have made extensions of this work for lower bit rates. Specifically we have looked at reducing the sampling rate by use of digital interpolation and at extending the technique to quantization rates as low as one bit per sample. The algorithms we have implemented run at rates in the range of 6 to 16 kbps. The coders below 9 kbps are probably not useful because their quality is too poor, but they do demonstrate the power of the noise shaping and post-filtering concept. The 9, 12 and 16 kbps coders would be useful in applications requiring a low complexity coder with only a single encoding. This paper describes the algorithms, their implementation using the WE (R) DSP32 signal processor, and their performance.

Author

*Algorithms; Voice Data Processing; Signal to Noise Ratios; Real Time Operation*

**20060003170** NEC Corp., Chiba, Japan, Japan

**Implementation of a Multi-Pulse Speech Codec with Pitch Prediction on a Single Chip Floating-Point Signal Processor**

Fukui, A.; Shibagaki, K.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 22B3.1 - 22B3.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

The multi-pulse speech coding with pitch prediction has been known as an efficient speech coding technique for coding speech at a bit rate of 8 to 9.6 kbps. To implement this coding method on a signal processor for real time applications, problems exist concerning the amount of computations, speech quality, and the data RAM size on a signal processor. As countermeasures against these problems, we propose: 1) Correlation computation amount reduction method by utilizing pitch periodicity of the impulse response, 2) Pulse search method to modify pulse amplitude by only a small amount of computations in order to improve speech quality, 3) Efficient use of the memory space of a signal processor. These methods made it possible to implement a 8 to 9.6 kbps multi-pulse speech codec with pitch prediction with an optimum analysis frame length of 20 ms on a single chip 32-bit floating point signal processor (#PD77230).

Author

*Signal Processing; Voice Data Processing; Signal Analyzers; Coding*

**20060003187** Pennsylvania State Univ., PA, USA

**A Transform Based Covariance Differencing Approach Bearing Estimation**

Prasad, S.; Williams, R. T.; Mahalanabis, A. K.; Sibul, L., II; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 26.10.1 - 26.10.4; In English; See also 20060003045; Copyright; Avail.:

Other Sources

In recent years a new, and very powerful technique for parameter estimation--the eigenstructure, or signal subspace method--has been developed. Eigenstructure algorithms are closely related to Pisarenko's method for estimating the frequencies of sinusoids in white Gaussian noise. In theory they yield asymptotically unbiased estimates of arbitrarily close parameters, independent of the signal-to-noise ratio. Although signal subspace methods have proven to be powerful tools, they are not without drawbacks. An important weakness of all signal subspace algorithms is their need to know the noise covariance explicitly. The important problem of developing signal subspace based procedures for signals in noise fields with unknown covariance has not been satisfactorily addressed. It is our intent to propose a solution to the problem of direction-of-arrival estimation for a broad class of unknown noise fields. We will then briefly discuss other important estimation problems for which modified versions of this procedure can be applied.

Author

*Algorithms; Parameter Identification; Random Noise; Signal to Noise Ratios; White Noise*

**20060003190** Schlumberger Palo Alto Research, CA, USA

**Experiments in Isolated Digit Recognition with a Cochlear Model**

Loeb, Eric P.; Lyon, Richard F.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 27.3.1 - 27.3.4; In English; See also 20060003045

Contract(s)/Grant(s): N00039-84-C-0585; Copyright; Avail.: Other Sources

We have conducted speaker-independent isolated digit recognition experiments using vector quantized cochleagrams. Without the use of time order information, we were able to achieve a recognition rate of 97.24%. With a modified Viterbi algorithm we achieved a rate of 98.38%. Since we achieved a 98.05% recognition rate with a scheme that did static pattern matching on the first and second time-halves of our utterances, we must call into question the effectiveness with which the Viterbi algorithm uses time order information. Our results also lead us to conclude that future progress may depend on our ability to construct more sophisticated vector quantizers.

Author

*Cochlea; Pattern Recognition; Digits*

**20060003191** Hong Kong Univ., Hong Kong

**Speaker-Independent Isolated Word Recognition Using Word-Based Vector Quantization and Hidden Markov Models**

Cheung, Y. S.; Leung, S. T.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 1135-1138; In English; See also 20060003045; Copyright; Avail.: Other Sources

In this paper, we investigate the possibility of using word-based vector quantization with hidden Markov models for speaker-independent isolated word recognition. Two word-based algorithms were proposed and studied. Experiments were carried out on Chinese (Cantonese) digits spoken by 110 speakers (55 males and 55 females) in two databases. An improves of about 3% in recognition rate was obtained in one of the word-based algorithms. The results and implications are discussed.

Author

*Speech; Vector Quantization; Words (Language); Digits*

**20060003199** Tsinghua Univ., Beijing, China

**A Large-Vocabulary Chinese Speech Recognition System**

Huang, Xue-Dong; Cai, Lian-Hong; Fang, Di-Tang; Ci, Bian-Jin; Zhou, Li; Jian, Li; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 27.12.1 - 27.12.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

In this paper, we introduce a speaker dependent isolated word recognition system which is dedicated for Chinese character input. The method presented here offers an effective solution to the large-vocabulary isolated word recognition. The classification is performed hierarchically. In the preselection stage, the candidates are selected by KNN rule using the utterance length and coarse templates. A ranked list of candidates is obtained by the following final classifier which performs a nonlinear time alignment uncompressed templates using DTW algorithm. The recognition rate is more than 90% when monosyllables take up 1/3 of the vocabulary (1000).

Author

*China; Speech Recognition; Templates*

**20060003200** Matsushita Research Inst. Tokyo, Inc., Kawasaki, Japan

**A Telephone Speech Recognition System Using Word-Spotting Technique Based on Statistical Measure**

Kimura, Tatsuya; Niyada, Katsuyuki; Hiraoka, Shoji; Morii, Shuji; Watanabe, Taisuke; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 1175-1178; In English; See also 20060003045; Copyright; Avail.: Other Sources

A telephone speech recognition system for an isolated word which has sufficient performance in practical use is reported here. Word spotting technique is applied to the system so as to keep it relatively immune from noise. Word spotting is performed by a new time normalization algorithm based on linear time distortion pattern matching method named COLM (Continuous Linear Matching). The method includes only simple operations such as look up tables and additions. The entire system is implemented in a small board including a single digital signal processor. An experiment proved 96.4% average recognition rate. The experiment was carried out using 10 Japanese numerals pronounced by 240 males and females through telephone lines.

Author

*Digital Systems; Pattern Recognition; Speech Recognition; Words (Language)*

**20060003680** Helsinki Univ. of Technology, Espoo, Finland

**Simulation Of A Digital Signal Processing Architecture Based On The Data Flow Principle**

1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1053-1056; In English; See also 20060003631; Copyright; Avail.: Other Sources

The data flow principle has been proposed to be used for digital signal processing applications. To be able to analyze the properties and performance of this kind of an architecture computer simulations have been used. This paper discusses the simulation model used and gives some practical results based on the simulation experiments. The simulations show that the data flow principle can be efficiently used for digital signal processing in environments demanding high throughput and flexibility.

Author

*Computerized Simulation; Signal Processing; Data Flow Analysis*

**20060003719** Centro Studi e Laboratori Telecomunicazioni, Turin, Italy

**Multiplication-Free Filters For Subband Coding Of Speech**

Pirani, Giancarlo; Rusina, Fulvio; Zingarelli, Valerio; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 848-851; In English; See also 20060003631; Copyright; Avail.: Other Sources

Recently, the subband coding scheme for transmission of speech has been shown to be a promising technique for achieving high quality at medium bit rates (in the range between 16 and 32 kbit/s). The complexity of this coder depends partly on the banks of filters which are used in the transmitter to split the speech signal into several bands and, in the receiver, to reconstruct the signal. In this paper a way of reducing this complexity is investigated by analyzing some methods of designing multiplier-free filters, the coefficients of these filters are powers of two, thereby substituting each multiplication with a shift, it is considered that each filter of the banks may have up to 32 coefficients and that the two banks may include 3D filters the number of avoided multiplications is quite challenging. A key point of this design is to find directly the power-of-two coefficients through a nonlinear optimization technique. The performance degradations of the overall system is also

investigated when the power-of-two coefficients are used instead of the infinite-precision ones.

Author

*Coding; Multipliers; Voice Data Processing*

### 33

## ELECTRONICS AND ELECTRICAL ENGINEERING

Includes development, performance, and maintainability of electrical/electronic devices and components; related test equipment; and microelectronics and integrated circuitry. for related information see also *60 Computer Operations and Hardware*; and *76 Solid-State Physics*. For communications equipment and devices see *32 Communications and Radar*.

**20060002635** Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Netherlands

### **Test Report EMC/EMI Analysis TETRA**

Van der Valk, Ing. A.; June 2005; 37 pp.; In English; Original contains color illustrations

Report No.(s): TNO-DV1 2005 A071; TD2005-0327; Copyright; Avail.: Other Sources

In connection with the installation of the new digital C2000-network for the Law Enforcement and Security Services (OOV-services), relative to this network potential occurrence of risky or undesirable situations due to interference with electronics in vehicles was investigated. This new network functions according to the TETRA standard in the frequency band from 380 MHz to 400 MHz. In the context of order number 4 6686.11, issued by the Center for Technology & Mission Support of the Royal Army (KL) as main contractor of the Royal Constabulary (MAR), research has been performed into the influence of TETRA communication equipment on vehicle-related electrical accessories and electronic systems.

Author

*Communication Equipment; Radio Frequency Interference*

**20060002748** Princeton Univ., NJ USA

### **Plasma Acceleration from RF Discharge in Dielectric Capillary**

Dunaevsky, A.; Raitses, Y.; Fisch, N. J.; Aug. 2005; 22 pp.; In English

Report No.(s): DE2005-842400; PPPL-4094; No Copyright; Avail.: Department of Energy Information Bridge

Plasma acceleration from rf discharge in dielectric capillary was demonstrated. Observed plasma flow had ion energies of approx.100 eV and electron energies of approx.20 eV. The discharge was powered by a MHz-range rf generator and fed by Ar. Experimental results indicate possible validity of assumptions about formation of a potential difference at the open end of the capillary and presence of hot electron fraction in the capillary discharge. Simplicity and small dimensions of the source are attractive for micro-propulsion applications.

NTIS

*Capillary Flow; Dielectrics; Plasma Acceleration; Plasmas (Physics); Radio Frequencies*

**20060002751** Princeton Univ., NJ USA

### **Be Foil 'Filter Knee Imaging' NSTX Plasma with Fast Soft X-Ray Camera**

Stratton, B. C.; von Goeler, S.; Stutman, D.; Tritz, K.; Zakharov, L. E.; Aug. 2005; 12 pp.; In English

Report No.(s): DE2005-842399; PPPL-4093; No Copyright; Avail.: National Technical Information Service (NTIS)

A fast soft X-ray (SXR) pinhole camera has been implemented on the National Spherical Torus Experiment (NSTX). This paper presents observations and describes the Be foil Filter Knee Imaging (FKI) technique for reconstructions of a m/n=1/1 mode on NSTX.

NTIS

*Cameras; Image Processing; Imaging Techniques; Plasmas (Physics)*

**20060002756** West Virginia Univ., Morgantown, WV, USA

### **Advanced Solid State Sensors for Vision 21 Systems. (Final Report, September 11, 2001-December 31, 2004)**

Stinespring, C. D.; Apr. 28, 2005; 40 pp.; In English

Report No.(s): DE2005-842442; No Copyright; Avail.: Department of Energy Information Bridge

Silicon carbide (SiC) is a high temperature semiconductor with the potential to meet the gas and temperature sensor needs in both present and future power generation systems. These devices have been and are currently being investigated for a variety of high temperature sensing applications. These include leak detection, fire detection, environmental control, and emissions monitoring. In these devices, thermal stability of the interfaces has been shown to be an essential requirement for

improving and maintaining sensor sensitivity and lifetime. In this report, we describe device fabrication and characterization studies relevant to the development of SiC based gas and temperature sensors.

NTIS

*High Temperature; Semiconductors (Materials); Silicon Carbides; Solid State*

**20060002811** California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

**Methods of Attosecond X-Ray Pulse Generation**

Zholents, A.; January 2005; 10 pp.; In English

Report No.(s): DE2005-842053; No Copyright; Avail.: Department of Energy Information Bridge

We review several proposals for generation of solitary attosecond pulses using two types of free electron lasers which are envisioned as future light sources for studies of ultra-fast dynamics using soft and hard x-rays.

NTIS

*Free Electron Lasers; X Rays*

**20060002817** Lehigh Univ., Bethlehem, PA, USA

**Operation of the APS Photoinjector Drive Laser System**

Li, Y.; Dec. 2004; 14 pp.; In English

Report No.(s): DE2005-843176; No Copyright; Avail.: National Technical Information Service (NTIS)

The Advanced Photon Source (APS) photoinjector drive laser system has been in operation since 1999 and is achieving a performance level exceeding the requirement of stable operation of the LEUTL free electron laser (FEL) system. One remarkable number is the UV energy stability of better than 2% rms, sometimes less than 1% rms. This report summarizes the operation experience of the laser system and the improvements made along the way. We also outline the route of upgrade of the system and some frontier laser research and development opportunities in ultrabright electron beam generation.

NTIS

*Beam Injection; Electron Beams; Oscillations*

**20060002838** California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

**Quaternary InGaAsSb Thermophotovoltaic Diode Technology**

Dashiell, M.; Beausang, J.; Ehesani, H.; Nichols, G.; Depoy, D.; Jan. 26, 2005; 44 pp.; In English

Report No.(s): DE2005-850139; No Copyright; Avail.: National Technical Information Service (NTIS)

Thermophotovoltaic (TPV) diodes fabricated from InGaAsSb alloys lattice-matched to GaSb substrates are grown by Metal Organic Vapor Phase Epitaxy (MOVPE). 0.53eV InGaAsSb TPV diodes utilizing front-surface spectral control filters have been tested in a vacuum cavity and a TPV thermal-to-electric conversion efficiency ( $\eta_{\text{TPV}}$ ) and a power density (PD) of  $\eta_{\text{TPV}} = 19\%$  and  $\text{PD} = 0.58 \text{ W/cm}^2$  were measured for  $T_{\text{radiator}} = 950 \text{ C}$  and  $T_{\text{diode}} = 27 \text{ C}$ . Recombination coefficients deduced from minority carrier measurements and the theory reviewed in this article predict a practical limit to the maximum achievable conversion efficiency and power density for 0.53eV InGaAsSb TPV. The limits for the above operating temperatures are projected to be  $\eta_{\text{TPV}} = 26\%$  and  $\text{PD} = 0.75 \text{ W/cm}^2$ . These limits are extended to  $\eta_{\text{TPV}} = 30\%$  and  $\text{PD} = 0.85 \text{ W/cm}^2$  if the diode active region is bounded by a reflective back surface to enable photon recycling and a two-pass optical path length.

NTIS

*Diodes; Thermoelectric Power Generation; Energy Conversion Efficiency; Recombination Coefficient*

**20060002841** Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA

**Superconducting Cavities for Ion and Proton Linacs**

Delayen, J. R.; January 2005; 14 pp.; In English

Report No.(s): DE2005-850146; No Copyright; Avail.: National Technical Information Service (NTIS)

In the last decade, one of the most active areas in the applications of the superconducting rf (SRF) technology has been for the acceleration of ions to medium energy (approx.)1 GeV/amu and high power. One such accelerator is under construction in the U.S. while others are being proposed in the U.S., Japan, and Europe. These new facilities require SRF accelerating structures operating in a velocity region that has until recently been unexplored, and new types of structures optimized for the velocity range from (approx.)0.2 to (approx.)0.8 c have been developed. We will review the requirements

imposed by such applications, the properties of the low- and intermediate-velocity structures which have been developed for them and the status of their development.

NTIS

*Cavities; Linear Accelerators; Protons; Superconductivity*

**20060002843** Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA

**Analysis of the Medium Field Q-Slope in Superconducting Cavities Made of Bulk Niobium**

Ciovati, G.; Halbritter, J.; January 2005; 22 pp.; In English

Report No.(s): DE2005-850166; No Copyright; Avail.: National Technical Information Service (NTIS)

The quality factor of superconducting radio-frequency cavities made of high purity, bulk niobium increases with rf field in the medium field range (peak surface magnetic field between 20 and about 100 mT). The causes for this effect are not clear yet. The dependence of the surface resistance on the peak surface magnetic field is typically linear and quadratic. This contribution will present an analysis of the medium field Q-slope data measured on cavities treated with buffered chemical polishing (BCP) at Jefferson Lab, as function of different treatments such as post-purification and low-temperature baking. The data have been compared with a model involving a combination of heating and of hysteresis losses due to 'strong-links' formed or weakened at niobium surfaces during oxidation, which correlate to  $(\Delta)/kT(\text{sub c})$  changes by baking.

NTIS

*Cavities; Niobium; Slopes; Superconducting Cavity Resonators; Superconductivity*

**20060002845** Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA

**Characterization and Performance of a High-Power Solid-State Laser for a High-Current Photo-Cathode Injector**

Zhang, S.; Hardy, D.; Neil, G.; January 2005; 8 pp.; In English

Report No.(s): DE2005-850169; No Copyright; Avail.: National Technical Information Service (NTIS)

We report the characterization and performance of a diode-pumped, high-power, picosecond laser system designed for high-current photo-cathode accelerator injector at repetition rates of both 75MHz and 750MHz. The characterization includes measurement of the amplification gain, thermally induced beam mode variation, harmonic conversion efficiency, system's amplitude stability, beam pointing stability, beam profile, and pulse width for both frequencies.

NTIS

*Cathodes; High Current; High Power Lasers; Injectors; Solid State Lasers*

**20060002929** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Relay and Industrial Control Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-103383; EC02-31I-335314(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change in the following reports. This U.S. industry comprises establishments primarily engaged in manufacturing relays, motor starters and controllers, and other industrial controls and control accessories.

NTIS

*Census; Control Equipment; Economic Analysis; Economics; Industries; Manufacturing*

**20060002938** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Current-Carrying Wiring Device Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-103388; EC02-31I-335931(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides

essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing current-carrying wiring devices.

NTIS

*Census; Economic Analysis; Economics; Electric Current; Industries; Manufacturing; Wiring*

**20060002968** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. All Other Miscellaneous Electrical Equipment and Component Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-103391; EC02-31I-335999(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing industrial and commercial electric apparatus and other equipment (except lighting equipment, household appliances, transformers, motors, generators, switchgear, relays, industrial controls, batteries, communication and energy wire and cable, wiring devices, and carbon and graphite products). This industry includes power converters (i.e., AC to DC and DC to AC), power supplies, surge suppressors, and similar equipment for industrial-type and consumer-type equipment.

NTIS

*Census; Economic Analysis; Economics; Electric Equipment; Industries; Manufacturing*

**20060002969** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Other Electronic Component Manufacturing**

Jan. 2005; 52 pp.; In English

Report No.(s): PB2006-103396; EC02-31I-334419(RV); No Copyright; Avail.: CASI: [A04](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing electronic components (except electron tubes; bare printed circuit boards; semiconductors and related devices; electronic capacitors; electronic resistors; coils, transformers, and other inductors; connectors; and loaded printed circuit boards).

NTIS

*Census; Economic Analysis; Economics; Electronic Equipment; Industries; Manufacturing*

**20060002973** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Power, Distribution, and Specialty Transformer Manufacturing**

Dec. 2004; 52 pp.; In English

Report No.(s): PB2006-103397; EC02-31I-335311(RV); No Copyright; Avail.: CASI: [A04](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing power, distribution, and specialty transformers (except electronic components). Industrial-type and consumer-type transformers in this industry vary (e.g., step up or step down) voltage but do not convert alternating to direct or direct to alternating current.

NTIS

*Census; Economic Analysis; Economics; Industries; Manufacturing; Transformers*

**20060002978** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Motor, and Generator Manufacturing**

Dec. 2004; 52 pp.; In English

Report No.(s): PB2006-103398; EC02-31I-335312(RV); No Copyright; Avail.: CASI: [A04](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing electric motors (except internal combustion engine starting motors), power generators (except battery charging alternators for internal combustion engines), and motor generator sets (except turbine generator set units). This industry includes establishments rewinding armatures on a factory basis.

NTIS

*Census; Economic Analysis; Economics; Electric Motors; Industries; Manufacturing*

**20060002991** ARCADIS Geraghty and Miller, Inc., Durham, NC, USA

**Evaluation of Former Landfill Site in Fort Collins, Colorado Using Ground-Based Optical Remote Sensing Technology**

Modrak, M.; Hashmonay, R. A.; Varma, R.; Kagann, R.; Apr. 2005; 60 pp.; In English

Report No.(s): PB2006-102403; No Copyright; Avail.: CASI: [A04](#), Hardcopy

A former landfill site in Fort Collins, Colorado is being assessed for landfill gas emissions as part of an effort under the city's Brownfields program to support reuse options for the property. Before initiating any additional development at the property, the city requested assistance from the EPA Region 8 Office, and the Office of Superfund Remediation and Technology Innovation, Technology Integration and Information Branch to perform a site assessment to search for the presence of any fugitive gas emissions from the former landfill site. This assessment was necessary due to the potential adverse health effects associated with exposure to landfill gas. The focus of this study was to evaluate fugitive emissions of methane and VOCs at the site, in support of the reuse objectives, using a scanning open-path Fourier transform infrared spectrometer, open-path tunable diode laser absorption spectroscopy, and an ultra-violet differential optical absorption spectrometer.

NTIS

*Colorado; Landfills; Methane; Remote Sensing*

**20060002993** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Other Motor Vehicle Electrical and Electronic Equipment Manufacturing**

Dec. 2004; 54 pp.; In English

Report No.(s): PB2006-103407; EC02-31I-336322(RV); No Copyright; Avail.: CASI: [A04](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing and/or rebuilding electrical and electronic equipment for motor vehicles and internal combustion engines.

NTIS

*Census; Economic Analysis; Economics; Electric Equipment; Electronic Equipment; Industries; Manufacturing; Motor Vehicles*

**20060002999** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-103364; EC02-31I-334515(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing instruments for measuring and testing the characteristics of electricity and electrical signals. Examples of products made by these establishments are circuit and continuity testers, volt meters, ohm meters, wattmeters, multimeters, and semiconductor test equipment.

NTIS

*Census; Economic Analysis; Economics; Electricity; Industries; Manufacturing; Measuring Instruments*

**20060003008** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Electronic Connector Manufacturing**

Jan. 2005; 50 pp.; In English

Report No.(s): PB2006-103357; EC02-31I-334117(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry

comprises establishments primarily engaged in manufacturing electronic connectors, such as coaxial, cylindrical, rack and panel, pin and sleeve, printed circuit and fiber optic.

NTIS

*Census; Connectors; Economic Analysis; Economics; Industries; Manufacturing*

**20060003010** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Electronic Resistor Manufacturing**

Jan. 2005; 50 pp.; In English

Report No.(s): PB2006-103355; EC02-31I-334115(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing electronic resistors, such as fixed and variable resistors, resistor networks, thermistors, and varistors.

NTIS

*Census; Economic Analysis; Economics; Industries; Manufacturing; Resistors*

**20060003011** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Electronic Coil, Transformer, and Other Inductor Manufacturing**

Jan. 2005; 50 pp.; In English

Report No.(s): PB2006-103356; EC02-31I-334116(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing electronic inductors, such as coils and transformers.

NTIS

*Census; Coil; Economic Analysis; Economics; Inductors; Industries; Manufacturing; Transformers*

**20060003013** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Printed Circuit Assembly (Electronic Assembly) Manufacturing**

Jan. 2005; 50 pp.; In English

Report No.(s): PB2006-103358; EC02-31I-334118(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of

materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in loading components onto printed circuit boards or who manufacture and ship loaded printed circuit boards. Also known as printed circuit assemblies, electronics assemblies, or modules, these products are printed circuit boards that have some or all of the semiconductor and electronic components inserted or mounted and are inputs to a wide variety of electronic systems and devices.

NTIS

*Census; Economic Analysis; Economics; Industries; Manufacturing; Printed Circuits*

**20060003016** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Semiconductor Machinery Manufacturing**

Jan. 2005; 54 pp.; In English

Report No.(s): PB2006-103302; EC02-31I-333295(RV); No Copyright; Avail.: CASI: [A04](#), Hardcopy

This report is about a U.S. industry consisting of establishments primarily engaged in manufacturing wafer processing equipment, semiconductor assembly and packaging equipment, and other semiconductor making machinery.

NTIS

*Census; Economics; Industries; Manufacturing; Semiconductors (Materials)*

**20060003020** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Electronic Capacitor Manufacturing**

Jan. 2005; 50 pp.; In English

Report No.(s): PB2006-103354; EC02-31I-334114(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing electronic fixed and variable capacitors and condensers.

NTIS

*Capacitors; Census; Economic Analysis; Economics; Industries; Manufacturing*

**20060003023** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Totalizing Fluid Meter and Counting Device Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-103363; EC02-31I-334514(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing totalizing (i.e., registering) fluid meters and counting devices. Examples of products made by these establishments are gas consumption meters, water consumption meters, parking meters, taxi meters, motor vehicle gauges, and fare collection equipment.

NTIS

*Census; Counters; Counting; Economic Analysis; Economics; Industries; Manufacturing*

**20060003045** Institute of Electrical and Electronics Engineers, USA

**IEEE International Conference on Acoustics, Speech, and Signal Processing (Proceedings: ICASSP '87), Volume 2** 1987; 682 pp.; In English; IEEE International Conference on Acoustics, Speech, and Signal Processing, 6-9 Apr. 1987, Dallas, TX, USA; See also 20060003046 - 20060003204

Report No.(s): IEEE-Catalog-87CH2396-0-Vol-2; LC-84-645139; Copyright; Avail.: Other Sources

A Frequency-Weighted Itakura Spectral Distortion Measure and Its Application to Speech Recognition in Noise Errors in Determining Vocal Tract Shape from the Acoustic Signal Rapid Speaker Adaptation Using a Probabilistic Spectral Mapping Estimation of Voice Source and Vocal Tract Parameters Based on ARMA Analysis and a Model for the Glottal Source Waveform Fuzzy Vector Quantization Applied to Hidden Markov Modeling Signal Modeling by Exponential Segments and Application in Voiced Speech Analysis Mixed-Phase Deconvolution of Speech on a Sine-Wave Model Topics discussed include: Set-Membership Theory Applied to the Linear Predictive Analysis of Speech; Beyond Quasi-Stationarity: Designing Time-Frequency Representations for Speech Signals; Power Spectrum Estimation with Uncertainty in the Sample Location of Correlation Measurements; An Accuracy Analysis of the Kumaresan-Tufts Method for Estimating Complex Damped Exponentials; Accurate Estimation of Closely-Spaced, Real, Decaying Exponentials in Noise; Signal Enhancement Using Canonical Projection Operators; A SVD-Based Transient Error Method for Analyzing Noisy, Multicomponent Exponential Signals; A High Resolution Data-Adaptive Time-Frequency Representation; Time-Frequency Signal Synthesis on Signal Subspaces; Digital Spectra of Non-Uniformly Sampled Signals with Applications to Digitally Synthesized Sinusoids; A Training Procedure for a Segment-Based-Network Approach to Isolated Word Recognition; Integration of Acoustic Information in a Large Vocabulary Word Recognizer; Experiments with the Tangora 20,000 Word Speech Recognizer; Multi-Style Training for Robust Isolated-Word Speech Recognition; Two-Stage Discriminant Analysis for Improved Isolated-Word Recognition; A Speaker-Stress Resistant Isolated Word Recognizer; Cepstral Domain Stress Compensation for Robust Speech Recognition; A New Time-Scale Warping Algorithm and Associated Modules for Single Dimensional and Multidimensional Speech Parameter Contours; and Fast Algorithms for Vector Quantization Picture Coding.

Derived from text

*Acoustics; Autoregressive Moving Average; Signal Processing; Vector Quantization; Speech Recognition; Sound Waves; Sine Waves; Signal Transmission; Frequency Synthesizers; Discriminant Analysis (Statistics); Cepstral Analysis; Algorithms*

**20060003055** SV Univ. Coll. of Engineering, Tirupati, India

**A New Scaling Procedure for Cascade Digital Filters**

Prasad, K. P.; Sathyanarayana, P.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 21.19.1 - 21.19.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

Scaling of filter variables is central to fixed point implementation of digital filters. A simple method of scaling based on scaling constants of individual sections of a cascade digital filter is presented. The proposed method saves a lot of computational labour in the implementation of higher order digital filters. Maximal amplitude expressions of second order filter transfer functions are also presented.

Author

*Digital Filters; Scaling*

**20060003068** Technische Univ., Vienna, Austria

**Time-Frequency Signal Synthesis on Signal Subspaces**

Hlawatsch, Franz; Krattenthaler, Werner; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 16.8.1 - 16.8.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

Signal synthesis is an indispensable part of signal processing schemes based on bilinear time-frequency representations like Wigner distribution, ambiguity function or spectrogram. We present a comprehensive theory of signal synthesis in which a signal subspace constraint imparts flexibility to the synthesis process. Representing the signal subspace by a projection operator or an explicit basis results in two different types of synthesis algorithms. Subspace synthesis is particularly suited for Wigner distribution and ambiguity function.

Author

*Time Signals; Frequency Synthesizers; Distribution Functions; Signal Processing; Spectrograms*

**20060003081** University of Southern Illinois, Carbondale, IL, USA

**On the Stability of Linear Shift-Variant Digital Filters**

Bose, Tamal; Brown, David P.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 21.3.1 - 21.3.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

The bounded-input bounded-output (BIBO) stability of shift-variant digital filters is investigated. Periodically shift-variant digital filters are considered and a Floquet-type solution is established. This is used to investigate the BIBO stability of a general periodically shift-variant digital system.

Author

*Digital Filters; Stability; Floquet Theorem; Digital Systems*

**20060003082** Tektronix, Inc., Beaverton, OR, USA

**Design of a Multistage Decimation-Interpolation Filter**

Hansen, Vic; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 900-903; In English; See also 20060003045; Copyright; Avail.: Other Sources

A two chip digital multi-rate FIR filter implemented in two micron CMOS performs 10 million multiplications and 20 million accumulations per second. The filter has 48 programmable bandwidths in a 1-2-5 sequence, and can either interpolate or decimate. This paper describes the design and implementation of the filter.

Author

*Fir Filters; Interpolation; Design Analysis*

**20060003083** UNIVERSITAET STUTTGART, Germany

**Digital Filter Structures Free of Limit Cycles**

Auer, Erich; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 904-907; In English; See also 20060003045; Copyright; Avail.: Other Sources

In this paper recursive, second-order, digital filter-structures are given, that are free of zero input limit cycles. This holds for the two cases of sign-magnitude- and two's complement-truncation applied immediately after each multiplication. These structures provide for very inexpensive, but limit cycle free implementations of recursive, digital filters. The results, given for the case of zero input, are in a second part extended to the case of constant input by a simple, so called bypass-structure for the over-all transfer function.

Author

*Digital Filters; IIR Filters; Transfer Functions; Cycles*

**20060003085** TRW LSI Products, La Jolla, CA, USA

**Phase Noise in Quantized Sine Waves**

Williams, Frederick A.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 21.17.1 - 21.17.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

Analysis of sampled and quantized signals has assumed no fixed relationship in time between the signal and the sampling clock. This assumption is invalid for some signals of importance: digitally synthesized sine waves, and NTSC color television signals. This results in an apparent interaction between sampling and quantization.

Author

*Time Signals; Counters; Sine Waves; Sampling; Color Television*

**20060003086** Virginia Polytechnic Inst. and State Univ., Blacksburg, VA, USA

**Direct Form Sensitivity Reduction by Order Increase**

Beex, A. A. Louis; deBrunner, Victor E.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 21.18.1 - 21.18.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

The sensitivity of a Direct II form digital filter can be reduced by a factor of up to 10. This is achieved by providing additional degrees of freedom in the Direct II form by increasing the order. To maintain the original system function to be implemented, this corresponds to the addition of cancelling pole-zero pairs. The location of the latter influences the overall sensitivity function. As a measure of sensitivity the sum of  $L_2$  norms of all first order partials of the system function is used. It is shown that this measure is particularly attractive because it can be evaluated efficiently and in closed form. This results from breaking down the sensitivity measure in terms of ARMA auto- and cross-covariances.

Author

*Sensitivity; Covariance; Digital Filters; Norms; Degrees of Freedom*

**20060003087** Fondazione Ugo Bordoni, Rome, Italy

**Elimination of the Pitch Bias in the Non- Stationary Characterization of Speech**

Ragazzini, S.; Ricotti, L. Prina; Orlandi, G.; Martinelli, G.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 22A1.1 - 22A1.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

An iterative method for removing the bias of the formants due to the pitch is proposed in connection with the parametric non-stationary estimation of long-term segments of speech. The method is illustrated by several examples and its effectiveness in the case of natural speech processing is clearly shown.

Author

*Speech Recognition; Iteration; Bias*

**20060003089** Tampere Univ. of Technology, Finland

**Median Type Filters with Linear Predictive Substructures**

Heinonen, Pekka; Neuvo, Yrjo; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 22A5.1 - 22A5.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

In this paper, we introduce a new class of FIR Median Hybrid (FMH) filters which contain linear FIR substructures to estimate the current signal value using forward and backward prediction. The output of the overall filter is the median of the predicted values and the actual signal value in the middle of the filter window. Predictors maximizing the signal to noise ratio on signal sections described by an  $l$ th order polynomial are derived. The ramp enhancement filters are shown to attenuate the noise on a ramp signal better than the Standard Median (SM) filters. The predictive FMH filters are shown to have root signals which do not exist from the SM filters, e.g. triangular waves. By combining the level and the ramp enhancement FMH filters, we obtain a filter which attenuates noise on constant and ramp signals.

Author

*Fir Filters; Median (Statistics); Predictions; Substructures*

**20060003093** Yale Univ., New Haven, CT, USA

**Adaptive Algorithms for Constrained ARMA Processes in the Presence of Noise**

Nehorai, Arye; Stoica, Petre; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 1003-1006; In English; See also 20060003045  
Contract(s)/Grant(s): DCI-8604351; Copyright; Avail.: Other Sources

A new family of algorithms is developed for adaptive parameter estimation of constrained autoregressive moving-average (ARMA) signals in the presence of noise. These algorithms utilize a priori known information concerning the signal's properties, such as its spectral shape or a spatial domain characteristic. Special cases include autoregressive (AR) and band-pass spectrum signals in the presence of noise, signal deconvolution and image deblurring.

Author

*Algorithms; Autoregressive Moving Average; Parameter Identification*

**20060003099** Johns Hopkins Univ., Laurel, MD, USA

**Optimal Sequences for Detection Using a Matched Filter Binary Integrator**

Widmer, Hans P.; Stapleton, John C.; Lafrance, Pierre; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 1107-1110; In English; See also 20060003045; Copyright; Avail.: Other Sources

The Matched Filter Binary Integrator (MFBI) is introduced as a simple circuit to improve range resolution in sonar applications. Equations giving the probabilities of detection and of false-alarm are derived for the MFBI, and the set of sequences that result in optimal MFBI performance are determined. The characteristics and properties of these sequences are described. The use of error-correcting codes for sequence generation is investigated.

Author

*Integrators; Matched Filters; Circuits; Sequencing; Probability Theory*

**20060003105** Wuhan Univ., China

**A New Iterative Method with Histogram Equalization Constraint for Reconstructing Image from Phase**

Yeping, Wang; Han, Li; Wenchun, Zhu; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 28.4.1 - 28.4.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

In this paper, a new constraint named histogram constraint is introduced and its reasonability is analyzed also. As an example, we use the histogram equalization constraint in the iterative course of image reconstruction from phase. The experiment results showed that the histogram equalization constraint improved the convergent speed of the iterative method enormously.

Author

*Image Reconstruction; Convergence; Histograms; Iteration*

**20060003121** Rice Univ., Houston, TX, USA

**A High Resolution Data-Adaptive Time-Frequency Representation**

Jones, Douglas L.; Parks, Thomas W.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 16.7.1 - 16.7.4; In English; See also 20060003045

Contract(s)/Grant(s): NSF ECS-83-14006; Copyright; Avail.: Other Sources

We present a data-adaptive time-frequency representation that obtains high resolution of signal components in time-frequency. This representation overcomes the often poor resolution of the traditional short-time Fourier transform, while avoiding the nonlinearities that make the Wigner distribution and other bilinear representations difficult to interpret and use. The new method uses adaptive Gaussian windows, with the window parameters varying at different time-frequency locations to maximize the local signal concentration in time-frequency. Two methods for selecting the Gaussian parameters are presented: a parameter estimation approach, and a method that maximizes a measure of local signal concentration.

Author

*Parameter Identification; Frequencies; Fourier Transformation; Quantum Mechanics*

**20060003122** Ilorin Univ., Nigeria

**A SVD-Based Transient Error Method for Analyzing Noisy, Multicomponent Exponential Signals**

Salami, M. J. E.; Nichols, S. T.; Smith, S. R.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 677-680; In English; See also 20060003045; Copyright; Avail.: Other Sources

The problem of estimating the parameters of noisy multicomponent signals using parametric modeling technique is considered in this paper. The multicomponent signal of interest is formed by a superposition of basic functions having the same location in time but different widths and amplitudes. Based on the modified Gardner transformation, some samples of deconvolved data are derived from the multicomponent signals. The deconvolved data are then modeled using a special nonstationary autoregressive moving average (ARMA) process in which the parameters of the ARMA model are obtained by linear least-squares procedure. The least-squares procedure is based on the singular value decomposition (SVD) to overcome the limitations of the transient error method (TEM) of analysis that uses cholesky decomposition to determine its AR coefficients. The moving average (MA) coefficients corresponds to the initial residual error sequences so as to account for the nonstationary noise in the deconvolved data. This new method of analysis, termed the SVD-based transient error method, produces high resolution estimates of the exponents of multicomponent signals at both low and high signal to noise (SNR) ratios.

Author

*Signal to Noise Ratios; Error Analysis; Cholesky Factorization; Autoregressive Moving Average; Decomposition; Estimating*

**20060003128** Utah Univ., Salt Lake City, UT, USA

**Image Compression Using Vector Quantization of Linear (One-Step) Prediction Errors**

Mathews, V. John; Waite, Randall W.; Tran, Thao D.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 18.3.1 - 18.3.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

A novel approach to image compression using vector quantization of linear (one-step) prediction errors is presented in this paper. In order to minimize the image reconstruction error, we choose the optimum predictor coefficients (in a least-squares sense) that satisfy the additional constraint that the energy of the impulse response function of the inverse reconstruction filter is bounded by a small constant  $c$ . Further, the code vectors are selected such that the reconstruction error is minimized, rather than the quantization noise for the prediction error sequences. Examples demonstrating the excellent quality of the reconstructed images using our approach at bit rates below 0.65 bit/pixel are presented.

Author

*Image Reconstruction; Data Compression; Vector Quantization; Linear Prediction; Errors; Image Processing; Noise Prediction*

**20060003129** Kaiser Electronics, San Jose, CA, USA

**Efficient Vector Quantization for Color Image Encoding**

Barrilleaux, J.; Hinkle, R.; Wells, S.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 18.5.1 - 18.5.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

The practical application of adaptive vector quantization to the encoding of a database of large color images is demonstrated. Methods for search space reduction, improved codebook initialization, empty cell treatment, and color vector coding are presented, with particular emphasis on encode time reduction. These variations to the basic vector quantization algorithm are compared in terms of computational complexity, execution time, and image quality. Experimental results are presented for a typical 256 x 256 pixel color image at a representative data rate of 2.0 bits/pixel, demonstrating over two orders of magnitude improvement in computation time.

Author

*Vector Quantization; Color Coding; Image Resolution; Algorithms*

**20060003132** San Diego State Univ., San Diego, CA, USA

**Image Coding Based on Segmentation Using Region Growing**

Thyagarajan, K. S.; Bohlmann, Helge; Abut, Huseyin; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 752-755; In English; See also 20060003045; Copyright; Avail.: Other Sources

This paper describes a composite source model for images. An image is segmented into uniform and homogeneous regions using centroid linkage region growing algorithms. The region homogeneity is determined by the Student T-statistics. Excessive regions resulting from region growing are merged according to region merging rules. The initially segmented image is then clustered into classes with the help of the K-means algorithm. The image classes are shown in this paper as visual aids in judging the classification procedure. The class numbers and the corresponding pixel counts are also included. Finally, as an application of composite source models, an image is encoded using matrix quantizers with separate codebook for each class of the image. The source structure will reflect the different textures inherent in the given image. On the other hand, if edge-shade information is used to classify an image, then some of the subsources will correspond to edges with different orientations while others will correspond to homogeneous regions with different textures. The study of a composite source model for images is described in this paper. An image is first segmented into uniform and homogeneous regions using region growing algorithms. Then some of the regions are merged with the help of region merging techniques. The merging step is necessary since the region growing usually results in an excessive number of regions. After merging the regions, the subsources are obtained by clustering the image pixels in the feature domain by means of a clustering algorithm,

Author

*Image Processing; Coding; Imaging Techniques; Segments; Centroids; Linkages*

**20060003138** Windsor Univ., Ontario, Canada

**Systolic ROM Arrays for Implementing RNS FIR Filters**

Taheri, M.; Jullien, G. A.; Miller, W. C.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 19.3.1 - 19.3.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

The Residue Number System (RNS), its concept, computational power, and applications have been investigated in the past [1,6,7]. Most of the studies have resulted in realizations suitable for discrete implementation [2,8]. This paper introduces a linear systolic array architecture for an RNS based FIR filter suitable for VLSI fabrication. The array, which is completely pipelined, consists of modular cells which only communicate to their nearest neighbor. The connected cells constitute a linear systolic array, and the construction of the cell is such that it can be programmed to function in many different DSP tasks. The final result is the construction of a linear systolic ROM that effectively replaces the previously used discrete ROM arrays.

Author

*Linear Arrays; Systolic Arrays; Very Large Scale Integration; Fabrication; Fir Filters*

**20060003139** NTT Electrical Communications Labs., Tokyo, Japan

**A Speech Feature Extraction System with a Linear Processor Array**

Emori, Teiji; Tachibana, Masatoshi; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 19.4.1 - 19.4.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

A speech feature extraction system for speaker-independent continuous phoneme recognition requires high performance in the 50 MIPS range. The vector processes in feature extraction can be capped into parallel processes on a linear array which

consists of multiple processing elements (PEs). Each PE takes charge of the processes of each vector element and extracts features by repeating product-and-sum operations and data/ instruction transfers between two neighboring PEs. Like a systolic array. The system has a hierarchical configuration with one general purpose digital signal processor (DSP) as the upper Layer and a Linear array as the tower Layer. An experimental system with 16 PEs in the tower Layer is shown to have about 20 times the processing capability of a single-Layered system using only one DSP.

Author

*Linear Arrays; Signal Processing; Speech Recognition; Digital Systems; Signal Analyzers*

**20060003153** Pennsylvania Univ., Philadelphia, PA, USA

#### **The Design and Application of Optimal FIR Fractional Phase Filters**

Pyfer, Mark F.; Ansari, Rashid; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 896-899; In English; See also 20060003045

Contract(s)/Grant(s): N00014-80-K-0945; Copyright; Avail.: Other Sources

A new technique for the design of FIR fractional-slope phase filters based on Chebyshev approximation is described and analyzed. The technique results from a formulation of the problem which satisfies the Haar condition, thus allowing the use of the efficient Remez exchange algorithm. The new design is implemented with a modification of the McClellan-Parks-Rabiner FIR filter design program. The resulting fractional-slope phase filters are shown to have a complex error function that is essentially equiripple in magnitude. The new technique may be used for designing parallel elements of a multirate filter, such as the polyphase interpolation filter, or for stand-alone filters used as fractional-slope phase shifters. The advantages of the new technique are the simplicity and numerical stability of the design program and the lack of restrictions on phase slope specification.

Author

*Fir Filters; Chebyshev Approximation; Numerical Stability; Error Functions*

**20060003155** Illinois Univ., Urbana, IL, USA

#### **Hankel Approximation Methods of IIR Filter Design**

Arun, K. S.; Reuter, M.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 920-923; In English; See also 20060003045; Copyright; Avail.: Other Sources

Presented in this paper are three design methods that use singular value decomposition and principal components analysis to construct IIR filters that approximate a desired filter response. The desired response may be specified in either the time domain or the frequency domain. The singular values of certain Hankel matrices constructed from the filter specifications, display the error in approximating the desired response by filters of different orders. The designer chooses the filter order based on the error that can be tolerated. An advantage common to these methods is that the user does not have to prespecify the filter order. Two of the new design methods have an additional advantage: They can be used when only the desired amplitude-response of the filter is specified, and the filter's phase response is unimportant. (Finally, in comparison to some extant design methods, the methods investigated here, seem to produce high-quality filters using lower orders.)

Author

*Fir Filters; IIR Filters; Frequency Response; Principal Components Analysis; Approximation*

**20060003158** Bell Telephone Labs., Inc., Murray Hill, NJ, USA

#### **Finite Limiting Effects for a Band-Limited Gaussian Random Process With Applications to A/D Conversion**

Morgan, Dennis R.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 21.16.1 - 21.16.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

The theory of finite limiting effects for a band-limited Gaussian random process is reviewed and a mathematical expression for the asymptotic distortion spectrum is derived which is accurate for frequencies outside of the original bandwidth. An expression is also derived for the total distortion power which is shown to be useful for estimating the aliased distortion spectrum when sampling is employed to form a discrete-time signal. An important application of these results is in A/D conversion, where the input signal is implicitly limited by the largest quantization level. Curves are given for the overall signal-to-distortion-plus-quantization-noise ratio (SDQR) as a function of normalized input level and number of bits carried, and show that the maximum SDQR is realized over a narrow range of input levels which is centered at about -12 dB relative to full-scale for an 8-bit A/D.

Author

*Random Processes; Signal Distortion; Time Signals; Estimating; Bandwidth*

**20060003162** Northeastern Univ., Boston, MA, USA

**Nonminimum Phase System Identification via Cepstrum Modeling of Higher-Order Cumulants**

Nikias, Chrysostomos L.; Pan, Renlong; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 980-983; In English; See also 20060003045

Contract(s)/Grant(s): N00014-86-K-0219; Copyright; Avail.: Other Sources

A new computationally efficient identification procedure is proposed for a non-Gaussian white noise driven linear, time-invariant, non-minimum phase system. The method is based on the idea of computing the complex cepstrum of higher-order cumulants of the system output. In particular, the differential cepstrum parameters of the systems impulse response are computed directly from higher order cumulants via least-squares solution. The method is flexible enough to reconstruct the minimum and maximum phase components of the impulse response of MA, AR or ARMA systems without any prior knowledge of the type of the system. It does not require model order selection criteria and is shown to provide estimates with small bias and variance even with 'short' length data records.

Author

*White Noise; System Identification; Frequency Response; Phase Shift; Autoregressive Moving Average*

**20060003163** Georgia Inst. of Tech., Atlanta, GA, USA

**Performance Analysis of New Least Squares ARMA Lattice Modeling Algorithms**

Karlsson, Erlendur; Hayes, Monson H.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 984-987; In English; See also 20060003045

Contract(s)/Grant(s): DAAG29-84-K-0024; ECS-8352161; Copyright; Avail.: Other Sources

At the ICASSP'86 conference in Tokyo we introduced a new efficient ARMA lattice structure that is fully consistent with the geometrical characteristics of the AR and MA lattice structures in that it is realized in terms of a fully orthogonal set of lattice vectors and it evaluates all optimal ARMA filters of lower order than a given maximum order. In that same paper we briefly described a class of RLS algorithms for the evaluation of the ARMA lattice filter coefficients. In this paper that class of algorithms is expanded and the numerical properties of the algorithms are investigated. Practical implementation issues are also discussed.

Author

*Algorithms; Reliability Analysis; Least Squares Method; Autoregressive Moving Average*

**20060003164** Indian Inst. of Tech., New Delhi, India

**Exact Recursive Least Squares Algorithms for ARMA Modeling**

Prasad, Surendra; Joshi, S. D.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 991-994; In English; See also 20060003045; Copyright; Avail.: Other Sources

The development of recursive algorithms for ARMA filtering has been somewhat slow to come by until very recently. Lee et al. [1] proposed ladder realizations for ARMA filtering by imbedding the ARMA model into a 2-channel AR model. Karlsson and Hayes [2] have proposed an orthogonal decomposition of the underlying Hilbert space of inputs and outputs for this purpose. These and all other related works are concerned with situations where the driving point inputs are assumed to be observable, along with the output data. The case when these are not observable directly has been typically handled by approximate 'bootstrapping' or other iterative techniques as in [1]. The present paper aims to present an entirely new approach for the development of 'exact' recursive least squares algorithms for ARMA filtering and modeling when the inputs (assumed here to be 'white') are not observable. The approach is heavily based on the recently, proposed 'predictor-space' representation of ARMA processes [3] and the use of some new, more general projection operator update formulas, briefly summarized here.

Derived from text

*Autoregressive Moving Average; Decomposition; Algorithms*

**20060003165** Southern Methodist Univ., Dallas, TX, USA

**A Principal Component Approach for Adaptive ARMA Model Identification**

Heidarian, Kambiz; Yu Hen, Hu; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 1000-1002; In English; See also 20060003045

Contract(s)/Grant(s): ECS-8404628; MDA903-86-C-0182; Copyright; Avail.: Other Sources

This paper presents a numerically stable method for adaptive ARMA model parameter identification. Our approach derives the data adaptive formulation of a novel principal component based system identification method proposed by K.S.

Arun. It is shown that the new method exhibits significant performance gain.

Author

*Parameter Identification; Decomposition; Covariance; Matrices (Mathematics); Autoregressive Moving Average; Algorithms*

**20060003166** Notre Dame Univ., IN, USA

**Application of a Recursive Estimation Algorithm with Information-Dependent Updating to ARMAX Models and ARMA Models with Unknown Inputs**

Huang, Y. F.; Rao, Ashok K.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 1007-1010; In English; See also 20060003045

Contract(s)/Grant(s): ECS-8505218; Copyright; Avail.: Other Sources

A new recursive estimation algorithm which has been used for the parameter estimation of ARX models is extended to the more general ARMAX case. Sufficient conditions for the convergence of the algorithm are derived. Simulation results show that consistent parameter estimates are obtained for a large range of model parameters.

Author

*Algorithms; Autoregressive Moving Average; Parameter Identification*

**20060003173** Toledo Univ., OH, USA

**A Signal Processing Cell Architecture**

Jamali, M. M.; Hussain, M. M.; Jullien, G. A.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 24.6.1 - 24.6.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

A data flow general purpose digital signal processor has been previously developed [i] for real time applications of digital signal processing. The Data Flow Signal Processor (DFSP) is attached to a host computer, and is based on a binary tree structure. It employs two types of cells: processing and arithmetic cells, and utilizes residue number system [2] for arithmetic operations. The objective of this work is to develop architecture of the processing cell [3]. This processing cell is simulated on a VAX 11/785 computer system utilizing A Hardware Programming Language (AHPL) [4]. Simulation results shows that processing cell architecture is valid and DFSP is capable of high throughput rates. This paper describes structure and operation of the processing cell. cycle. To provide data in every clock cycle, many of the DSP have one or more memory banks, several buses, and number of address calculation units. One problem with this approach is that increasing the word length may result in either change in the design or reduction in speed. Moreover multiplication / accumulation operation and its support circuitry may occupy a large portion of the DSP chip. Our approach is to develop a general purpose signal processor which may be software configurable and appropriate for real time signal processing applications. In order to achieve this goal a general purpose data flow signal processor has been developed [i]. The architecture is

Author

*Signal Processing; Information Flow; Digital Systems; Real Time Operation; Programming Languages; Circuits*

**20060003175** Zoran Corp., Santa Clara, CA, USA

**The Decomposition of Long FFT's for High Throughput Implementation**

Shenhav, Rivka; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 24.8.1 - 24.8.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

One of the major limiting factors in high throughput FFT systems implementation is the bus bandwidth. The data traffic over the bus consists of 3 types: input/output data, exponential coefficients (W factors) and instruction code (for the executing processor). Reduction of the bus load requires employment of a dedicated processor with internal memory and LUT (for the W factors) that will be able to compute certain sized FFT modules. Computation of larger sized FFT's using these smaller sized modules then requires support by an external LUT. Minimization of this LUT size and the bus load effect of the twiddle factor introduction can be achieved through full exploitation of the nature of the W factors behavior in the FFT passes. The decomposition of the large FFT into smaller modules for this purpose is explored and a high throughput system (up to 2.2MHz for FFT's of up to 16K points) implementation based on this approach, with the Zoran ZR34161 Vector Signal Processor is presented.

Author

*Fast Fourier Transformations; Channels (Data Transmission); Signal Processing; Decomposition*

**20060003176** California Univ., Santa Barbara, CA, USA

**Variable Block-Size Image Coding**

Vaisey, D. Jacques; Gersho, Allen; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 25.1.1 - 25.1.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

Current algorithms for the efficient coding of images generally employ one of two techniques: Vector Quantization or Transform Coding. Both of these methods are based on block coding, and the traditional algorithms require the partitioning of the original image into a number of, usually square, regions of uniform size. This paper explores techniques where the size of these regions, or blocks, is varied according to the local detail of the image. By isolating regions of differing detail, using a quad-tree based segmentation algorithm to control the size of the blocks, the low detail areas can be encoded at substantially lower rates than is otherwise possible. Satisfactory quality coding results are achieved at rates between 0.35 and 0.4 bpp; the actual rate depends on the image being encoded.

Author

*Coding; Algorithms; Vector Quantization; Trees (Mathematics)*

**20060003178** Eastman Kodak Co., Rochester, NY, USA

**Color Image-Sequence Compression Using Adaptive Binary-Tree Vector Quantization with Codebook Replenishment**

Chia-Lung, Yeh; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 1059-1062; In English; See also 20060003045; Copyright; Avail.: Other Sources

We present a new adaptive vector-quantization scheme with codebook replenishment for color image-sequence compression in this paper. This scheme uses mean/residual vector quantization with binary-tree search algorithm to vector-quantize the Y component and the low-passed I and Q components of color images. It also incorporates an objective criteria for codebook replenishment. The mean and label replenishment technique is also applied to further reduce the bit-rate. Computer simulations on two 60-frame, 512 x 512 color image-sequences have demonstrated the effectiveness of the proposed technique.

Author

*Binary Data; Trees (Mathematics); Data Compression; Image Processing; Sequencing; Vector Quantization*

**20060003201** Tohoku Univ., Sendai, Japan

**An Image Reconstruction from Limited View Angle Projection Data**

Saito, Tsuneo; Kudo, Hiroyuki; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 1187-1190; In English; See also 20060003045; Copyright; Avail.: Other Sources

In this paper, we deal with the problem on tomographic image reconstruction from limited view angle projection data. Based on the Helgason-Ludwig consistency condition, a new procedure for completion of incomplete projection data is introduced to improve the reconstructed image quality. Using regularization method, the robust algorithm to the presence of noise is presented. The performance of new algorithm was confirmed in the numerical simulation. The reconstructed images were quantitatively improved by this procedure with realistic amount of computation.

Author

*Image Reconstruction; Image Resolution; Computation; Algorithms; Density Distribution*

**20060003631** Institute of Electrical and Electronics Engineers, New York, NY, USA

**1982 International Symposium on Circuits And Systems, Volume 3**

[1982]; 560 pp.; In English; 1982 International Symposium on Circuits and Systems, Volume 2, 10-12 May 1982, Rome, Italy; See also 20060003632 - 20060003765

Report No.(s): IEEE-Catalog-82CH1681-6-Vol-3; LC-80-646530; Copyright; Avail.: Other Sources

These reports focus on electronic systems mostly dealing with analog, digital signal processing, and the circuit-design tasks using numerical analysis. They examine the drawbacks in application as well as the difficulties when trying to extend them to the simulation tasks. They also discuss the statistics of quantization error, the techniques for investigating the performance of filters in the presence of errors, graph theory, VLSI layout Theory and algorithms, and Channel Routing systems.

Derived from text

*Circuits; Conferences; Error Analysis; Numerical Analysis; Signal Processing*

**20060003632** National Univ. of Ireland, Dublin, Ireland

**Stability And Exact Synthesis Of Low-Pass Switched-Capacitor Filters**

Baher, Hussein; Scanlan, Sean O.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 725-727; In English; See also 20060003631; Copyright; Avail.: Other Sources

An exact synthesis algorithm is given for the design of leap-frog switched capacitor lowpass filters using LDI-type

building blocks. No assumptions are made regarding the sampling rate, except that of satisfying the sampling theorem. A simple test is also presented which allows the stability of a given SC network to be checked very easily.

Author

*Capacitors; Switching; Algorithms; Stability; Transfer Functions; Impedance*

**20060003633** Sperry Univac, Roseville, MN, USA

**Some Complexity Results On The Single Row Approach To Wiring**

Raghavan, Raghunath; Sahni, Sartaj; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 768771; In English; See also 20060003631

Contract(s)/Grant(s): NSF MCS-80-005856; Copyright; Avail.: Other Sources

This paper presents the results of the investigation of a systematic approach to the multilayer wire routing problem: the single row approach. In this method, the general problem is decomposed into a number of conceptually simpler single row wiring problems. Each step of the method is considered under a variety of optimization criteria, and the computational complexity is given. A majority of the complexity results are new.

Author

*Wiring; Optimization; Complex Systems; Wire*

**20060003634** Free Univ., Brussels, Belgium

**Design Of FIR Digital Filters With Arbitrary Specifications And Quantized Coefficients**

Grenez, F.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982]; See also 20060003631; Copyright; Avail.: Other Sources

When designing a FIR linear phase filter, it is always necessary to provide a security margin between the infinitely precise frequency response and the specifications, in order to absorb the frequency response degradation due to coefficient quantization. The approximation problem can be solved efficiently with respect to the security margin, in place of the habitual error function, for optimizing the quantized solution. The resulting statistical word-length of the coefficients provides a good insight into the filter-length word-length tradeoff for arbitrary specifications, as illustrated by some examples.

Author

*Far Infrared Radiation; Digital Filters; Frequency Response; Degradation*

**20060003635** Bulgarian Academy of Sciences, Sofia, Bulgaria

**Low-Frequency 'Input' Impedance Of A Non-Autonomous Self-Oscillating System**

Damgov, V. N.; Georgiev, P. G.; Russeva, G. A.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 831-834; In English; See also 20060003631; Copyright; Avail.: Other Sources

The phenomenon of changing the equivalent impedance of a non-autonomous self-oscillating system as regards the external video-frequency-band signals has been examined. The study is based on the example of a synchronous oscillator with non-linear resonance circuit and negative resistance. The considerable dependence of the video-frequency-band impedance on the synchronous frequency (within the synchronous bandwidth) has been demonstrated. The original method used in this paper is developed on the basis of the method of Samoylo and Spasov (7, 8).

Author

*Impedance; Low Frequencies; Circuits; Nonlinearity; Bandwidth*

**20060003639** Texas Univ., Austin, TX, USA

**Open Guided-Wave Structures For Millimeter-Wave Integrated Circuits**

Itoh, Tatsuo; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 957-; In English; See also 20060003631

Contract(s)/Grant(s): N00014-79-C-0553; F49620-77-C-0101; DAAG29-81-K0053; Copyright; Avail.: Other Sources

Recent development and potential advantages of open guided wave structures are described for applications to millimeter-wave integrated circuits. Several waveguide structures are illustrated with a new insight to guiding mechanism. We explain passive components, antennas, active components and nonreciprocal and control devices. Some of the important problems to be solved are identified.

Author

*Waveguides; Millimeter Waves; Integrated Circuits; Dielectrics*

**20060003640** Korea Advanced Inst. of Science and Technology, Seoul, Korea, Republic of

**A Network Partitioning Algorithm Using the Concept of Connection Index**

Park, Chin S.; Park, Song B.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 985-988; In English; See also 20060003631; Copyright; Avail.: Other Sources

Based on a new concept of 'connection index' of a weighted graph, a new efficient heuristic algorithm of  $O(v \cdot e)$  for network partitioning is presented, where  $v$  and  $e$  are the number of nodes and edges, respectively. Experimental results show that our algorithm is very efficient and yields an optimal or near optimal solution for a number of partitioning problems tested.

Author

*Algorithms; Indexes; Partitions*

**20060003641** International Business Machines Corp., Yorktown Heights, USA

**Eigensolutions In Top-Down Layout Design**

Otten, Ralph H. J. M.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1017-1020; In English; See also 20060003631; Copyright; Avail.: Other Sources

Abstract: Global methods to recover or derive structure from unstructured (netlist) data are presented.

Author

*Layouts; Sequencing; Wiring; Domains; Containment; Boundaries; Nets*

**20060003643** Research Inst. for Telecommunications, Budapest, Hungary

**On Some Qualitative Properties Of Large Scale Nonlinear Circuits And Systems**

Roska, Tamas; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1062-1065; In English; See also 20060003631; Copyright; Avail.: Other Sources

After defining the term 'large scale' two theorems are proved. The first is a uniqueness theorem for large scale systems, this sufficient condition covers a larger class of problems than the known one. The second is a practical application of a theorem of the author for well-posed circuit analysis problems. Namely, practical conditions are given, under which a /large/ circuit analysis problem can be considered well-posed when the circuit is composed of MOS and bipolar transistors characterized by the models used in the circuit analysis programs.

Author

*Bipolar Transistors; Nonlinear Systems; Electric Networks; Network Analysis*

**20060003644** Universidade Federal do Rio Grande do Norte, Natal, Brazil

**Synthesis Of Active RC Filters Via State-Space Realization In Arrow Form**

Rego, J. I.; Hsu, L.; Kaszkurewicz, E.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1078-1081; In English; See also 20060003631; Copyright; Avail.: Other Sources

This paper presents a synthesis method for active RC filters with a prescribed rational transfer function. The method utilizes a special state-space realization called 'arrow realization'. The resulting structure for the filter is composed of a Foster RC network,  $n$  voltage followers (isolation amplifiers) and two summers, where  $n$  is the degree of the characteristic polynomial of the given transfer function.

Author

*Polynomials; Voltage Amplifiers; Rc Circuits; Transfer Functions*

**20060003645** Notre Dame Univ., IN, USA

**Topological Conditions On Multiple-Fault Testability Of Analog Circuits**

Huang, Z. F.; Lin, C. S.; Liu, Ruey-wen; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1152-1155; In English; See also 20060003631

Contract(s)/Grant(s): N00014-78-C-0444; Copyright; Avail.: Other Sources

The topological conditions for  $k$ -node,  $k$ -cut fault, and  $k$ -rank branch-set fault testability by single test signal vector in analog circuits are given. These conditions which are both necessary and sufficient are essential in the choice of test points. These conditions also have applications to the design of testable circuits. The outcome of these methods can be further diagnosed by the usage of multiple test signal vectors. This is also discussed and the associated problems are studied.

Author

*Analog Circuits; Topology; Electrical Faults*

**20060003646** GTE Labs., Inc., Waltham, MA, USA

**A Generalized Testability Analysis Algorithm For Digital Logic Circuits**

Fong, James Y. O.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1160-1163; In English; See also 20060003631; Copyright; Avail.: Other Sources

As circuit integration density increases, the need for efficient high-level testability analysis algorithm also grows. This paper presents a new testability analysis algorithm that can analyze the testability of complex digital circuits at the functional level. It also discusses experimental results obtained through application of the proposed algorithm.

Author

*Algorithms; Digital Electronics; Logic Circuits; Iteration; Mathematical Models*

**20060003647** Technical Univ. of Denmark, Lyngby, Denmark

**A Compact Nine-Valued Logic Simulation Algorithm**

Knudsen, M. S.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1190-1193; In English; See also 20060003631; Copyright; Avail.: Other Sources

A nine-valued logic simulation algorithm suitable especially for a fast and accurate analysis of digital NMOS-circuits is presented. The algorithm is based upon a state transition table approach and has two distinct advantages. First of all, the response of general NMOS-gates can be calculated very rapidly. Secondly, hazard phenomena and critical races will be detected while the state transition tables are being evaluated; time-consuming searches in a table of occurring events are not necessary. The simulation algorithm is based upon a very compact data structure whereby it is possible to analyze digital systems of a 1500-gate complexity on a HP 9825 desk calculator with 60 K bytes of memory. Experiments show that the analysis time is not related to the circuit size.

Author

*Algorithms; Digital Electronics; Logic Circuits; Simulation*

**20060003648** Toronto Univ., Ontario, Canada

**Switched Capacitor Filters Eliminating Operational Amplifiers**

Jamal, Habibullah; Holmes, Frank E.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 733-736; In English; See also 20060003631; Copyright; Avail.: Other Sources

Some novel switched capacitor filter circuits are described. A bucket-brigade type charge transfer principle is used to avoid the use of operational amplifiers. This results in reduced chip area, static power, and noise. The circuits were implemented with enhancement type NMOS transistors and MOS capacitors as the only components. Results of designs based on LCR ladder simulation and bilinear z-transforms are presented.

Author

*Capacitors; Operational Amplifiers; Switching; Circuits*

**20060003649** Florence Univ., Italy

**On the Synthesis Of Passive Switched Capacitor Low Pass Filters**

Liberatore, A.; Manetti, S.; Ricci, A.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 737-740; In English; See also 20060003631; Copyright; Avail.: Other Sources

A new technique or the synthesis of passive switched capacitor low pass filters is presented. A particular coupling structure, realized by a switched capacitor passive circuit is employed, which provides a given d.c. gain with a limited capacitance spread.

Author

*Low Pass Filters; Circuits; Capacitors; Switching; Capacitance*

**20060003650** Technical Univ. of Poznan, Poznan, Poland

**Improved Zero Phase Lag Integrators With Grounded Switched Capacitors**

Dabrowski, Adam; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 749-752; In English; See also 20060003631; Copyright; Avail.: Other Sources

Two methods for eliminating of a phase error and effects of parasitic capacitances of switched-capacitor integrators are proposed. Both realizations of so called 'improved' integrators contain Only parallel switched capacitors. By this means sensitivity to the parasitic capacitances to ground is naturally reduced because of grounding the switched capacitors. The first method is based on an SC-circuit - RC-prototype correspondence introduced by Temes et al. (4,5), and on a general SC-circuit

synthesis procedure proposed by the author of this paper (9). The second method for elimination of the phase lag consists in application of two separate periodically switched feed-back loops instead of one as in the classic SC integrator (2).

Author

*Phase Error; Capacitors; Integrators; Switching; Capacitance; Loops; Circuits*

**20060003651** Korea Advanced Inst. of Science and Technology, Seoul, Korea, Republic of  
**Realization Of R-C And L-C Parallel Combinations In The Scf Design Employing Voltage Inverter Switches**

Lee, Bang W.; Park, Song B.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 753-755; In English; See also 20060003631; Copyright; Avail.: Other Sources

By using a new SCF element and a proper switching scheme, parallel R-C or L-C combination can be realized without a voltage inverter switch (VIS) in its own loop, in the SCF design approach employing VIS's. Experimental results for low-pass and bandstop filters gave a good agreement with the theoretical characteristics.

Author

*Inverters; Switches; Self Consistent Fields; Electric Potential; Switching*

**20060003652** Linköping Univ., Sweden

**A Comparison Of Wave Digital Lowpass Filters From An Implementation Point Of View**

Wanhammar, Lars; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 776-779; In English; See also 20060003631; Copyright; Avail.: Other Sources

A comparison is made of the estimated chip area, power consumption, etc. for the LSI implementation of a fifth-order wave digital lowpass filter derived from some common types of reference filters. The implementation technique is based on distributed arithmetic.

Author

*Digital Filters; Estimating; Large Scale Integration; Energy Consumption*

**20060003653** Linköping Univ., Sweden

**Some Aspects On the LSI-Implementation Of Wave Digital Filters**

Sikstroem, Bjoern; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 780-783; In English; See also 20060003631; Copyright; Avail.: Other Sources

In this paper we show that wave digital filter structures, using several special processors, are excellent from an LSI point of view. The main purpose of this paper is to show that wave digital filters are especially suitable for LSI and VLSI.

Author

*Digital Filters; Large Scale Integration; Very Large Scale Integration; Circuits*

**20060003654** Pontificia Univ. Catolica, Rio de Janeiro, Brazil

**Sensitivity Analysis Of The Weighting Sequence Of FIR Digital Filters - A Simplified Approach**

Hallot, Olivier H. P.; Pavani, Ana M. B.; Barreto, Jorge M.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 808-811; In English; See also 20060003631; Copyright; Avail.: Other Sources

A method was developed to allow an easy calculation of the sensitivity of the weighting sequence (impulse response) of a recursive FIR digital filter to approximations in the coefficients being synthesized. Although the sensitivity calculation depends only on products of vectors and matrices, and therefore can easily be accomplished, the inverse of a particular type of matrix is present in every product to be performed. The purpose of this work is to present special properties of this matrix which allow its inverse to be obtained from the solution of a linear, time-invariant difference equation. These properties also lead to important simplifications in the computation of the sensitivity, making it possible to skip products of matrices and vectors.

Author

*Sensitivity Analysis; Digital Filters; Fir Filters*

**20060003655** Alberta Univ., Edmonton, Alberta, Canada

**On The Fast Amplitude Control In Rc-Oscillators**

Filanovsky, I. M.; Piskarev, V. A.; Stromsmoe, K. A.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 819-822; In English; See also 20060003631; Copyright; Avail.: Other Sources

The paper considers the amplitude control dynamics in RC oscillators with AC-DC transformation circuits without delay

elements. It is shown that in this case the step response speed of the envelope is limited by a slew rate which depends on the loading ability of a transconductance amplifier or multiplier included in the amplitude control loop. Examples of circuits with fast settling amplitude control loops and the results of their experimental investigation are given.

Author

*Oscillators; Alternating Current; Circuits; Transconductance*

**20060003656** Naples Univ., Italy

**The Cesari-Fabry Method And Its Applications To Quasi-Sinusoidal Oscillators**

Di Bello, Carlo; Greco, Oreste; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 827-830; In English; See also 20060003631; Copyright; Avail.: Other Sources

A method which enables to ensure the existence and uniqueness of stable quasi-sinusoidal oscillations in the circuit with a single nonlinearity is proposed. A broad class of non-linear elements that ensure oscillations is characterized.

Author

*Oscillations; Nonlinearity; Circuits*

**20060003659** Centro Studi e Laboratori Telecomunicazioni, Turin, Italy

**Downlink Performance Degradations Caused By An On-Board Baseband Switching Matrix**

Amadesi, Paolo; Pattini, Franco; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 856-859; In English; See also 20060003631; Copyright; Avail.: Other Sources

A digital satellite link with an on-board baseband switching matrix is assumed. The performance degradation of the downlink transmission quality caused by imperfections of the signal at the output of the matrix is analyzed and is proved to be moderate, but rather sensitive to the choice of the decision instant at the ground receiver. It is evaluated that this sensitivity can be reduced by the insertion of a clock recovery and data retiming circuit at the output of the switching matrix.

Author

*Downlinking; Degradation; Switching; Switching Circuits; Matrices (Circuits)*

**20060003660** Jiaotong Univ., Xian, China

**The Performance Index Of Passive Signal Transmission Systems And The Evaluation Of The Index**

Hong, Bin Chen; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 860-863; In English; See also 20060003631; Copyright; Avail.: Other Sources

The performance of a transmission System H21 can be specified by the integral. When the impedance of a passive signal transmission system as viewed from the receiving side is a non-minimum-reactance, the integral cannot be directly evaluated by using the result of Bode's resistance integral theorem: we can only obtain an inequality. The difficulty arises from the fact that the contour of integration passes through poles on the imaginary axis. To eliminate this difficulty a different method for evaluating the integral using time domain artifice is developed. This method removes the inequality sign and yields definite results that can be calculated by simple arithmetic manipulation.

Author

*Reactance; Signal Transmission; Impedance; Inequalities*

**20060003663** Telettra S.p.A., Italy

**Computation Of Phase And Delay From Attenuation**

Orsucci, Marzio; Pupolin, Silvano; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 884-887; In English; See also 20060003631; Copyright; Avail.: Other Sources

A new method to obtain the phase (or the delay) from attenuation for minimum phase network is proposed. It is based on a two step technique. First, we compute the phase of a rough approximation of the attenuation in band and accurate approximation in the stop band by using an extension of Bode's method, then we evaluate the phase of the difference between the attenuation and its rough approximation via FFT. An example of application to the design of the receiver equalizer of a digital system is reported.

Author

*Fast Fourier Transformations; Phase Transformations; Digital Systems; Receivers*

**20060003664** Chuo Univ., Tokyo, Japan

**Linear Algebraic Equations With Constant Coefficients Whose Solutions Satisfy A Given Set Of Linear Differential Equations With Constant Coefficients**

Shinoda, Shoji; Mayeda, Wataru; Yasuda, Tomoshige; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 892-894; In English; See also 20060003631

Contract(s)/Grant(s): 00435013; Copyright; Avail.: Other Sources

In the case where samplings are not restricted to equal intervals, the existence of linear algebraic equations with constant coefficients whose solutions satisfy a given set of linear differential equations with constant coefficients is shown.

Author

*Algebra; Differential Equations; Linear Equations; Coefficients*

**20060003665** Waterloo Univ., Ontario, Canada

**An Accelerated Class Of Optimization Methods In Function Space**

Quintana, V. H.; Mayorga, R. V.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 899-902; In English; See also 20060003631; Copyright; Avail.: Other Sources

Lenard (1) has recently studied a family of accelerated conjugate direction methods for unconstrained optimization in  $R^n$ . This paper extends this acceleration class of algorithms into function space, in particular, for the solution of the unconstrained continuous optimal control problems.

Author

*Algorithms; Function Space; Optimization; Iteration; Optimal Control*

**20060003666** Linköping Univ., Sweden

**Systems, Models And System Identification**

Ljung, Lennart; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 907-910; In English; See also 20060003631; Copyright; Avail.: Other Sources

Some basic aspects of the system identification problem are addressed, such as how to formulate the problem, how to formalize the notion of a model and how to validate the model. A central concept in the treatment is the one step ahead prediction. It is displayed how this concept unifies the model description as well as the identification techniques.

Author

*System Identification; Systems Analysis; Prediction Analysis Techniques*

**20060003668** Technische Hogeschool, Delft, Netherlands

**Least Squares Approximation Of The Spectral Function Of An Outer System**

Dewilde, P.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 935-937; In English; See also 20060003631; Copyright; Avail.: Other Sources

Given the spectrum or the covariance information of a minimal phase transfer function, we show how least squares approximations of the same type can be obtained. Also, it is shown how these approximants may be realized by means of stable numerical structures.

Author

*Approximation; Covariance*

**20060003670** Rome Univ., Rome, Italy

**Planar Microwave Elliptic Low-Pass Filters With Minimum-Delay Characteristic**

Giannini, F.; Salerno, M.; Sorrentino, R.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 949-952; In English; See also 20060003631; Copyright; Avail.: Other Sources

In this paper a new class of microwave elliptic low-pass filters is introduced, constituted by the direct connection of rectangular two-port planar structures. Under a two-mode approximation of the electromagnetic field distribution, a synthesis method is described starting from the transformation of a lossless ladder elliptic filter. Both theoretical analyses and experiments performed on microstrip structures at frequencies up to 18 GHz prove that the approximation is sufficient to obtain excellent pass-band and satisfactory stop-band characteristics.

Author

*Electromagnetic Fields; Low Pass Filters; Microwaves*

**20060003671** Santa Clara Univ., CA, USA

**Topological Considerations of the Via Minimization Problem for Two-Layer PC Boards**

Chen, R. W.; Kajitani, Y.; Chan, S. P.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 968-971; In English; See also 20060003631; Copyright; Avail.: Other Sources

Attempts have been made recently to solve the via minimization problem for two-layer printed circuit (PC) boards using graph theory. In this paper, an algorithm for via minimization of routing on a two-layer PC board is presented with the restriction of no more than three line segments incident at each junction, and an example is given to illustrate the steps in the algorithm. Furthermore, it is shown that the algorithm can be executed in polynomial time.

Author

*Algorithms; Circuit Boards; Printed Circuits*

**20060003672** Illinois Univ., Urbana, IL, USA

**Decomposition Algorithms For The Shortest Path Problem**

Hajj, Ibrahim N.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 975-978; In English; See also 20060003631

Contract(s)/Grant(s): n00014-79-c-0424; Copyright; Avail.: Other Sources

Algorithms for computing the shortest paths in partitioned networks are presented. Partitioning is obtained by ordering the measure matrix of the network into a bordered-block-diagonal form. The algorithms differ from ones previously proposed in that the subnetworks can be processed in any order separately or in parallel without the need for analysis sequencing in which the subnetworks are processed in a particular order.

Author

*Algorithms; Decomposition; Sequencing*

**20060003674** Shandong Univ., Jinan, China

**Enriched Matrix Techniques And Path Problem**

Hu, Zong-xuan; Fang, Yong-sui; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 993-996; In English; See also 20060003631; Copyright; Avail.: Other Sources

An enriched matrix used to efficiently represent a graph is described. Using the enriched matrix, an algorithm to find all of the paths between two specified vertices in a given graph is then presented. The longest one among the paths can be obtained in at most  $O(N \times MD)$  time. and the rest in less or much less than  $O(N \times MD)$  time, where  $N$  is the number of vertices, and  $MD$  is the maximum number of adjacent vertices among all vertices in the graph. According to Dijkstra(1), it is quite easy to get all of the shortest paths connecting any two vertices by the algorithm proposed.

Author

*Algorithms; Matrices (Mathematics); Graphs (Charts); Apexes*

**20060003675** General Electric Microelectronics Center, Research Triangle Park, NC, USA

**A Router For Single Layer CMOS Gate Arrays**

Wightower, David. W.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1005-1008; In English; See also 20060003631; Copyright; Avail.: Other Sources

This paper describes SILICA (Single Layer Interconnect of CMOS Arrags), a system of programs that can route most commercially available single layer CMOS gate arrays. A major part of the system is a line routing program which uses a modified Moore algorithm(1) with a set of linked lists which significantly decreases its execution time.

Author

*Computational Grids; CMOS; Routes*

**20060003676** Osaka Univ., Suita, Japan

**An Algorithm Of Global Routing For Master Slice LSI**

Tsukiyama, Shuji; Harada, Ikuo; Fukui, Masahiro; Shirakawa, Isao; Ozaki, Hiroshi; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1009-1012; In English; See also 20060003631; Copyright; Avail.: Other Sources

A global routing scheme for master slice LSI's is described which consists of two phases; initial routing and rerouting.

A main objective of both phases is to distribute all interconnection requirements over routing channels, so as to attain 100% interconnections within a limited area.

Author

*Large Scale Integration; Algorithms; Technology Assessment*

**20060003677** Sharp Corp., Nara, Japan

**A General Cell Layout System for VLSI**

Chiba, T.; Okuda, N.; Kambe, T.; Nishioka, I.; Inufushi, T.; Kimura, S.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1013-1016; In English; See also 20060003631; Copyright; Avail.: Other Sources

A global routing scheme for master slice LSI's is described which consists of two phases; initial routing and rerouting. A main objective of both phases is to distribute all interconnection requirements over routing channels, so as to attain 100% interconnections within a limited area.

Author

*Wiring; Layouts; Very Large Scale Integration; Algorithms*

**20060003678** Illinois Univ., Urbana, IL, USA

**Optimal Error Spectrum Shaping for Cascade-Form Digital Filters**

Higgins, William E.; Munson, David C., Jr.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1029-1032; In English; See also 20060003631

Contract(s)/Grant(s): N00014-79-C-0424; Copyright; Avail.: Other Sources

Error spectrum shaping (ESS) is an effective technique for reducing roundoff noise in narrow-band digital filters. Recent work has shown how to choose the ESS coefficients optimally in second-order filters. In this paper, we show how to choose the ESS coefficients optimally in high-order filters composed of cascaded second-order sections. Examples are presented comparing the performance of both optimal and suboptimal ESS structures with that of canonical and so-called section optimal structures.

Author

*Digital Filters; Errors; Narrowband; Coefficients*

**20060003681** California Univ., Los Angeles, CA, USA

**Existence Of Solutions For Nonlinear Networks**

Willson, Alan N., Jr.; Jingtang, Wu; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1066-1069; In English; See also 20060003631

Contract(s)/Grant(s): ENG79-11321; Copyright; Avail.: Other Sources

New theorems are presented which show how the location and the value of independent sources can be used in assessing whether or not a solution exists for the dc equations of a very general class of nonlinear networks. The application of the theory to the dc equations of bipolar transistor circuits is specifically considered, and an example is given using a simple differential amplifier circuit.

Author

*Nonlinearity; Transistor Circuits; Bipolar Transistors*

**20060003682** Belgrade Univ., Macedonia

**New Methods For Analysis And Compensation Of GIC-Derived Biquads**

Popovich, Miodrag V.; Mistic, Vojislav B.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1090-1093; In English; See also 20060003631; Copyright; Avail.: Other Sources

A new analysis method for determining the effects of the finite amplifier bandwidth on the characteristics of the GIC-derived biquads is presented. This method gives more accurate predictions of the pole Q deviations than other known methods, which is verified experimentally. A passive compensation method is also proposed for restoring the pole frequency or Q factor to their designed values. The experimental work confirmed the feasibility of this method.

Author

*Operational Amplifiers; Electrical Impedance; Converters; Methodology*

**20060003683** Warsaw Technical Univ., Poland

**High-Frequency Realization Of C-OTA Second Order Active Filters**

Urbas, Alesander; Osowski, Jerzy; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1106-1109; In English; See also 20060003631

Contract(s)/Grant(s): NSF INT-75-02093; Copyright; Avail.: Other Sources

New two realizations of second order filters containing two operational trans-conductance amplifiers (OTA's) and two or three capacitors are presented. Due to pole compensation of OTA the proposed structures are suitable for high frequencies. They are also found to have low sensitivity to variations of element values.

Author

*High Frequencies; Operational Amplifiers; Filters*

**20060003684** Toronto Univ., Ontario, Canada

**A Novel Approach To Transfer-Function Error Modelling With Application To Filter Approximation**

Snelgrove, W. M.; Sedra, A. S.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1127-1131; In English; See also 20060003631; Copyright; Avail.: Other Sources

A new technique for investigating the performance of filters in the presence of errors is outlined. The technique is shown to make clear fundamental limitations on sensitivity performance for filter realizations and to allow a designer to take component tolerances into account at the approximation stage of filter design. It also suggests a novel way to simultaneously approximate attenuation and group delay specifications.

Author

*Approximation; Errors; Transfer Functions; Mathematical Models*

**20060003686** Concordia Univ., Canada

**Multifrequency Method Of Fault Diagnosis In Analogue Circuits**

Charalambous, C.; Antoniou, A.; Motamedi, Z.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1144-114; In English; See also 20060003631; Copyright; Avail.: Other Sources

This paper deals with multiple-fault diagnosis for linear analogue circuits. The proposed approach is based on multifrequency measurements of some voltage (transfer function) at the accessible output port and can be used for the multiple-fault location. It utilizes certain algebraic invariants properties of the transfer functions w.r t, to the set of faulty elements. Computationally it reduces to checking of the existence or nonexistence of a common solution of two systems of linear equations (this amounts to the findings of the rank of a matrix). These linear equations are derived via symbolic representation of the measured voltage (transfer function) accessible for the measurements. The numerical example of application of such an approach is given,

Author

*Analogs; Circuits; Error Analysis; Linear Circuits*

**20060003687** Kyoto Univ., Japan

**Conditions For Network-Element-Value Determination By Multifrequency Measurements**

Ozawa, Takao; Yamada, Masaaki; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1156-1159; In English; See also 20060003631

Contract(s)/Grant(s): MOE 00435013; Copyright; Avail.: Other Sources

Graph theoretical conditions for determining network-element-values by multifrequency measurements are given. The network under consideration is current excited. Equations derived from Kirchhoff's current law are used to determine element values. The coefficients of the equations are branch voltages and/or voltages multiplied by  $a=1/j\omega$ . The independence of such modified voltages are discussed using a new concept of the complex basis, which is a combination, in steady state, of the state variables and the basis of the network.

Author

*Graph Theory; Topology; Frequency Measurement*

**20060003688** California Univ., Berkeley, CA, USA

**An NMOS Integrated Vector-Locked Loop**

Senderowicz, Daniel; Hodges, David A.; Gray, Paul R.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1164-1167; In English; See also 20060003631

Contract(s)/Grant(s): NSF ENG-78-11397; Copyright; Avail.: Other Sources

A new vector-locked loop (VLL) circuit has been analyzed, an experimental version has been designed and fabricated as a single-chip NMOS integrated circuit. Its sinusoidal output is capable of tracking simultaneous frequency and amplitude reference signals at any frequency between 250 kHz and 500 kHz. The VLL has likely applications in signal generators, modulators and demodulators, continuous-time precision filters, and automatic gain control circuits.

Author

*Circuits; Fabrication; Metal Oxide Semiconductors; Chips (Electronics)*

**20060003689** Bath Univ., Bath, UK

**The Place Of Universal Logic Gates In LSI Gate Arrays**

Hurst, S. L.; Chen, X.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1168-1171; In English; See also 20060003631; Copyright; Avail.: Other Sources

There is increasing world-wide interest in the adoption of isi masterchip uncommitted gate arrays for small-quantity equipment applications, where the final interconnect metalization provides the unique custom-designed dedication. Here we will consider the adoption of universal-logic-gates as the standard cell in such a gate array, and show that the adoption of such cells provides an advantage over alternative choices such as component level or functional NAND or NOR cells.

Author

*Gates (Circuits); Large Scale Integration; Microelectronics; Electrical Engineering*

**20060003690** Technische Univ., Munich, Germany

**A New Approach To The Design Of Integrated Circuits By Interactive Optimization**

Antreich, K. J.; Huss, S. A.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1172-1175; In English; See also 20060003631; Copyright; Avail.: Other Sources

This paper presents a new and general approach to the nominal design problem of integrated circuits by interactive optimization. The approach is based on a viable and problem-transparent assessment criterion to visualize and interactively control the optimization process. As important procedures, we suggest selection criteria for the determination of the problem-dominant optimization parameters and an absolutely stable and efficient algorithm for the calculation of the assessment criterion.

Author

*Integrated Circuits; Optimization; Electrical Engineering*

**20060003692** California Univ., Berkeley, CA, USA

**Techniques For Robust DC Algorithms For Circuit Simulation**

Lejarasmee, Ekachai; Sangiovanni-Vincentelli, Alberto L.; Ruehli, Albert E.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1198-1201; In English; See also 20060003631; Copyright; Avail.: Other Sources

Methods for DC solution based on Newton's iteration are discussed, and some of the difficulties are identified. Effective modifications to improve the speed and reliability are proposed.

Author

*Algorithms; Circuits; Simulation; Iteration*

**20060003693** California Univ., Berkeley, CA, USA

**A New Relaxation Technique For Simulating MOS Digital Integrated Circuits**

Lejarasmee, Ekachai; Sangiovanni-Vincentelli, Alberto L.; Ruehli, Albert E.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1202-1205; In English; See also 20060003631; Copyright; Avail.: Other Sources

A new method for analysing large scale integrated circuits in the time domain is presented. This method, called Waveform Relaxation, decomposes the system of nonlinear differential equations describing the behaviour of the circuit by using a new relaxation scheme. The analysis of the properties of the method has shown that the method is particularly suited for the analysis of MOS digital circuits. For these circuits, we can prove that the method will always converge to the solution of the circuit differential equations provided that there is a grounded capacitor at every node of the circuit. Experimental results show over an order of magnitude speed improvement over standard simulators such as SPICE2 with no loss of accuracy.

Author

*Digital Electronics; Integrated Circuits; Large Scale Integration; Simulation; Waveforms; Relaxation Method (Mathematics)*

**20060003694** Bell Telephone Labs., Inc., Murray Hill, NJ, USA

**Layout Aspects Of The VLSI Microprocessor Design**

Colbry, B. W.; Soukup, J.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1214-1228; In English; See also 20060003631; Copyright; Avail.: Other Sources

A single 32-bit CPU chip was designed in a short time. with a strong emphasis on error checking. An advanced layout system contributed to this accomplishment. On the other hand, the design experience influenced the layout system; new features were requested by the designers, and a new methodology evolved. This paper is a collection of interesting cases encountered in the process. We document (mostly in pictures) a top-down hierarchical layout, manual planning mixed with automatic processing, on-line rule checking, and advanced routing including the routing of power.

Author

*Microprocessors; Very Large Scale Integration; Layouts; Chips (Electronics); Systems Engineering*

**20060003695** California Univ., Berkeley, CA, USA

**Performance Limits Of The Classic Circuit Simulation Program**

Vladimirescu, Andrei; Pederson, Donald O.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1229-1232; In English; See also 20060003631

Contract(s)/Grant(s): DAAG29-81-K-0021; AFOSR-82-0021; Copyright; Avail.: Other Sources

The performance of the new LSI simulator CLASSIE is evaluated on several circuits with a few hundred to over one thousand semiconductor devices. A more accurate run time prediction formula has been found to be appropriate for circuit simulators. The design decisions for optimal performance under the constraints of the hardware (CRAY-1) are presented.

Author

*Circuits; Large Scale Integration; Simulation; Computer Programs; Performance Tests*

**20060003696** TELEBRAS, Campinas, Brazil

**Communication Network Synchronization Plan: A Fuzzy Set Theoretical Approach**

Baptistella, L. F. B.; Aquino, L. A. C.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1241-1244; In English; See also 20060003631; Copyright; Avail.: Other Sources

The problem of choosing among many existing synchronization alternatives for communication networks depends upon many aspects to which moreover varying degrees of importance are attached. As the number of alternatives and the number of aspects are large, a complex-looking problem arise, principally due to the subjective aspects and uncertainty arising in this kind of decision problem. In this paper we propose a fuzzy set theoretical approach to deal with the choice of an adequate synchronization methodology for application on the brazilian digital network. As a consequence, some alternative synchronization methods are naturally isolated as the most preferable.

Author

*Communication Networks; Fuzzy Sets; Synchronism*

**20060003697** Rice Univ., Houston, TX, USA

**Nonlinear Circuits And Systems Applications Of Functional Splines**

de Figueiredo, Rui J. P.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1245-1248; In English; See also 20060003631; Copyright; Avail.: Other Sources

Nonlinear functional and operator splines are introduced and their application to nonlinear circuits and systems is indicated. In the modeling of nonlinear systems, approximation by means of these splines offers certain advantages over that by Wiener's approach.

Author

*Circuits; Nonlinearity; Splines; Mathematical Models*

**20060003698** Belgrade Univ., Macedonia

**The Influence Of The OP-AMP Nonidealities On The SAB Filter Transfer Function**

Reljin, Branmir D.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1086-1089; In English; See also 20060003631; Copyright; Avail.: Other Sources

The influence of the operational amplifier(OA) imperfections on the single amplifier filter is considered. It was shown that the frequency-dependent OA gain,  $A(s)$ , has the predominant influence, while the OA input impedance is not of any practical interest. The finite output impedance affects the realized filter parameters, particularly at high frequencies, but this influence

may be neglected compared to  $A(s)$ . This statement was confirmed theoretically and experimentally by analyzing some well known active filters.

Author

*Operational Amplifiers; Transfer Functions; Bandpass Filters*

**20060003699** Technische Univ., Vienna, Austria

**Comparison Of Overload- And Noise-Characteristics Of Different F.D.N.R. Circuit Realisations**

Skritek, Paul; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1094-1097; In English; See also 20060003631; Copyright; Avail.: Other Sources

The paper compares different R-C network implementations for frequency dependent negative resistance (FDNR) circuits with two operational amplifiers (OA). Overload characteristics on the OA and total noise of the FDNR are calculated: The symmetrical FDNR type 3 with equal resistor values R and equal capacitances C yields optimum tradeoff with respect to the signal-to-noise ratio. It's minimum output noise current  $I(\text{sub } o) = 12kT(\text{sub } o)\omega(\text{sup } 2)D$  is independent of the R-C network impedance level. Input noise sources of the OAs should not exceed  $e(\text{sub } n)$  less than or equal to 3.5nV/the square root of HZ and  $i(\text{sub } n)$  less than or equal to 0.2pA/the square root of HZ as upper limits.

Author

*Frequencies; Negative Resistance Circuits; Noise Measurement; Operational Amplifiers*

**20060003700** Bell Telephone Labs., Inc., Holmdel, NJ, USA

**A Review of Current SC-Network Design Practice and Applications**

Laker, K. R.; Fleischer, P. E.; Marsh, D. G.; Saari, V. R.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 728; In English; See also 20060003631; Copyright; Avail.: Other Sources

The current trend in switched capacitor filter design is to take advantage of their inherent precision and full integrability with logic circuits to realize VLSI subsystems in monolithic form. In this paper two such systems, a complete CODEC and a self-contained dual-tone/dial pulse signaling receiver, will be presented. In addition, a high performance low power CMOS Op amp will be described.

Author

*Logic Circuits; Very Large Scale Integration; Decoders; Capacitors; Receivers*

**20060003701** Technical Univ. of Warsaw, Warsaw, Poland

**Synthesis Of Switched-Capacitor Biquadratic Sections Using Graphs**

Mulawka, Jan J.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 745-748; In English; See also 20060003631; Copyright; Avail.: Other Sources

A general approach to the synthesis of single amplifier switched-capacitor (SC) biquadratic sections is reported. The method is based on a proper partitioning of the denominator of a given transfer function and the use of resulting graphs representing general SC structures. The synthesis is illustrated by an example. The experimental results appear to be promising.

Author

*Capacitors; Switching; Operational Amplifiers*

**20060003702** Edinburgh Univ., UK

**Realization Of A Switched-Capacitor Voltage-Wave Bandpass Filter**

Reekie, H. Martin; Mavor, John; Denyer, Peter B.; Scanlan, Sean O.; Curran, Thomas; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 721-724; In English; See also 20060003631; Copyright; Avail.: Other Sources

This paper presents a novel approach to the design of bandpass filters which are suitable for eventual realization in monolithic form. The method is based on the use of sampled-data-analogue signals and is related to the wave digital filter in its design techniques. A realization of the filter in MOS technology would be in the form of a switched capacitor network. The design is exact and there is no requirement for a high relative clock frequency. Only unity-gain buffers are required, as opposed to high gain differential-input operational amplifiers, and so the technique is well suited to CMOS technology. Performance is determined by capacitance ratios and the design is optimally insensitive to parameter variations. A design for a prototype

third-order Chebyshev bandpass filter is presented, Good agreement with theory is obtained for the practical circuit realised in discrete form.

Author

*Bandpass Filters; Capacitors; Differential Amplifiers; Digital Filters; High Frequencies*

**20060003703** Kentucky Univ., Lexington, KY, USA

**Active Sensitivity Minimization In SAB's With Active Compensation And Optimization**

Natarajan, S.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1082-1085; In English; See also 20060003631; Copyright; Avail.: Other Sources

In this article, a new high gain three-port operational amplifier (OA) circuit is used to replace the single OA in single amplifier biquads (SAB's). The resultant biquads will have the first order effect of the OA's finite gain bandwidth products (GB) completely eliminated from their dominant pole frequencies. Then, the widely used band pass filter will be considered, where the remaining dominant second order effects of the OA's GB products will be minimized by choosing appropriate element spreads satisfying the technology. This results in a bandpass filter which has better performance than any other actively compensated filter.

Author

*Operational Amplifiers; Optimization; Sensitivity; Bandpass Filters*

**20060003704** Dortmund Univ., Germany

**Nonlinear Analog Switched-Capacitor Circuits**

Hosticka, B. J.; Brockherde, W.; Kleine, U.; Schweer, R.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 729-732; In English; See also 20060003631; Copyright; Avail.: Other Sources

This communication presents an approach to the design of nonlinear analog switched-capacitor (SC) circuits using building blocks. Two design examples will be discussed: an interpolative A/D converter and an FSK demodulator with a SC phase-locked loop.

Author

*Analog Circuits; Capacitors; Circuits; Switching*

**20060003705** West Virginia Univ., Morgantown, WV, USA

**A Mixed LDI-Bilinear Transformation For Biquadratic Switched Capacitor Filters**

Mikhael, W. B.; Tu, S.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 741-744; In English; See also 20060003631; Copyright; Avail.: Other Sources

A novel transformation, for the realization of biquadratic switched capacitor filters, incorporating the bilinear and the LDI transformations is proposed. This mixed transformation is shown to possess better approximation accuracy over the bilinear transformation as the ratio of the passband to the sampling rate increases. In addition, the discrete transfer functions thus obtained are shown to be stable and possess attractive realizability features. The design of biquadratic filters using the suggested transformation is given. Computer simulations and experimental results are presented which are in close agreement with the theory.

Author

*Capacitors; Switching; Transfer Functions*

**20060003706** Digital Equipment Corp., Maynard, MA, USA

**A Topological Representation For Single Layer Routing Problems With Variable Sized Objects**

Armstrong, Robert A.; Doreau, Michel T.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 772-775; In English; See also 20060003631; Copyright; Avail.: Other Sources

Single layer routing problems arise either naturally (single metal layers) or from decomposition of multilayer problems (PW boards, gate arrays). The available routing space is described only by constraints between pairs of fixed objects and techniques are provided for determining the minimal set of required constraints. All dimensions of obstacles, connections and constraint capacities are measured in rectilinear and diagonal units to allow 45 degree routing. The path of a connection is defined by the set of constraints that it intersects. Search strategies are presented that attempt to minimize the constraint violations in this inherently planar representation.

Author

*Diameters; Decomposition; Topology; Constraints*

**20060003707** California Univ., Berkeley, CA, USA

**A New Approach To Channel Routing**

Marek-Sadowski, M.; Kuh, E. S.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 764-767; In English; See also 20060003631

Contract(s)/Grant(s): F49620-79-C-018; NSF ENG-78-24425; Copyright; Avail.: Other Sources

Two-layer channel routing is one of the key elements in the automatic layout design of VLSI circuits. In the traditional approach of channel routing, one layer is used exclusively for horizontal connection and the other is used exclusively for vertical connection. Via holes are used for interconnections between layers. The present paper takes a new look of the problems by allowing horizontal and vertical connections on both layers. Thus the only restrictions are that on each layer nets must intersect and must not overlap on the same horizontal or vertical track. With this flexibility, the vertical constraint graph associated with the given net list is no longer required to be acyclic. Furthermore, the channel width is not bounded by the maximum density over the channel. An order-graph similar to the traditional vertical constraint graph is introduced in the development of our new algorithm.

Author

*Integrated Circuits; Very Large Scale Integration; Channels (Data Transmission)*

**20060003709** Texas Univ., Austin, TX, USA

**Synthesis And Implementation Of Recursive Linear Shift-Variant Digital Filters**

Nian-Chyi, Huang; Aggarwal, J. K.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 788-791; In English; See also 20060003631; Copyright; Avail.: Other Sources

In this paper, we propose two techniques to approximate a given impulse response as a degenerate sequence which is realizable as a recursive difference equation. Both techniques use a least squares error criterion to minimize the difference between the given and the approximated impulse responses. Numerical examples illustrating and comparing the results of these techniques are included. In addition, we present several recursive structures for the implementation of causal degenerate impulse responses.

Author

*Difference Equations; Digital Filters; Numerical Analysis*

**20060003710** Naval Postgraduate School, Monterey, CA, USA

**Efficient Special Purpose Linear Programming For Fir Filter Design**

1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 792-795; In English; See also 20060003631; Copyright; Avail.: Other Sources

A special purpose high efficiency linear programming method is developed for FIR filter design. This new method incorporates FFT and FIR zero phase filters to assist in the computation. Comparing to the general purpose linear programming, this special purpose linear programming produces large saving in the computing cost when used to design FIR filters. The saving increases with the length of the filter being designed.

Author

*Fir Filters; Linear Programming; Fast Fourier Transformations*

**20060003711** Naval Postgraduate School, Monterey, CA, USA

**A Discrete Coefficient Fir Digital Filter Design Based Upon An LMS Criteria**

Yong, Ching Lim; Parker, Sydney R.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 796-799; In English; See also 20060003631; Copyright; Avail.: Other Sources

An efficient method for designing discrete coefficient FIR digital filters based upon a LMS criteria is presented. Incorporating this optimization method into a tree search algorithm and employing a suitable branching policy, an efficient algorithm for the discrete optimization of the FIR filter coefficients is produced. The method does not suffer from the high computing cost of minimax methods and simplex based quadratic programming and can be used to design high order (256) discrete coefficient value FIR filters. The discrete coefficient spaces discussed includes evenly distributed space as well as nonuniformly distributed space such as the powers of two space.

Author

*Digital Filters; Fir Filters; Coefficients; Trees (Mathematics); Algorithms*

**20060003712** Tampere Univ. of Technology, Finland

**A New Class Of Linear-Phase Fir Filters For Decimation, Interpolation, And Narrow-Band Filtering**

Saramaki, Tapio; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 804-807; In English; See also 20060003631; Copyright; Avail.: Other Sources

A new class of linear phase nonrecursive digital filters for sampling rate reduction and sampling rate increase is discussed. The transfer function of these filters is of the form  $H(z) = A(zD)B(z)$  where  $D$  is the sampling rate conversion factor. The polynomial  $A(zD)$  is adjusted so that the overall magnitude response presents an equiripple behavior in the passband, whereas  $B(z)$  provides an equiripple stopband response. Several examples show that the new interpolators and decimators require significantly fewer multiplications per second than equivalent optimum FIR and elliptic designs. The performance of these filters is only slightly worse than that of the recursive filters of Martinez and Parks [I], even if their phase is linear. Furthermore, it is shown that by cascading multistage new decimators and interpolators, we obtain efficient narrowband filters requiring considerably fewer multiplications per output sample than equivalent elliptic designs.

Author

*Digital Filters; Fir Filters; Interpolation; Narrowband; Transfer Functions; Linear Filters*

**20060003713** Massachusetts Inst. of Tech., Cambridge, MA, USA

**Nonlinear Maximum Power Theorem With Solar Cell Application**

Wyatt, John L.; Chua, Leon O.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 812-814; In English; See also 20060003631

Contract(s)/Grant(s): ECS 8006878; Copyright; Avail.: Other Sources

A multiport maximum power theorem for nonlinear resistive networks is given. The optimal nonlinear load characteristic is specified as a closed form expression involving the constitutive relation of the source resistance. When applied to the problem of optimal loading of a solar cell, the theorem suggests a new approach which could simplify the hardware implementation.

Author

*Solar Cells; Theorems; Nonlinearity*

**20060003714** Texas Technological Univ., Lubbock, TX, USA

**Topological Criteria For The Existence Of Simple Solution Curves Of Nonlinear Resistive Networks**

Yun, C. O.; Chao, K. S.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 823-826; In English; See also 20060003631

Contract(s)/Grant(s): ECS-8103630; Copyright; Avail.: Other Sources

A generalized sufficient condition for the existence of a (unique) simple solution curve is developed. The condition deduced based on a parametric representation of a solution curve. Modified networks having identical  $(n - 1)$  network equations are generated and topological criteria associated with the sufficient condition are obtained from the examination of modified networks.

Author

*Nonlinearity; Networks; Topology; Curves; Solutions*

**20060003715** IBM Federal Systems Div., Yorktown Heights, NY, USA

**A Non 'Placement/Routing' Approach To Automation Of VLSI Layout Design**

Burstein, Michael; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 756-759; In English; See also 20060003631; Copyright; Avail.: Other Sources

One of the main disadvantages of the traditional layout process, consisting in handling the problem in two consecutive stages-placement and routing-is that there are no universal criteria for placement known. The main objective in placement stage is to produce a placement for which the subsequent routing can be carried out successfully, i.e. so called wireable placement. It can be shown that this leads to an NP-complete problem. In the proposed approach we do not split the problem into separate placement and routing stages. Those are obtained in a certain sense simultaneously. The layout process is based on a search of topological layout (topological imbedding into one or several planes) and subsequent geometrical realization of it. An attempt is made to dissect the entire network into planar parts, the number of which equals to the number of wiring layers, and to achieve more or less even distribution of nets among these layers. If it is not possible, several nets must be partitioned and realized in different layers. In this case vias are introduced to connect parts of the same net with each other. If we have an planar imbedding of a network into the plane, then we can generate a placement of it's vertices in the rectangular

grid according to this imbedding. But if we have more than one layer of metallization, then the imbeddings of subnetworks each in different layer may generate contradictory placements. Therefore, we will be required to construct in a certain sense coherent imbeddings, generating placements close to each other. The second stage will consist in geometrical realization of obtained imbeddings. We assume, that both horizontal and vertical direction wires can be realized on each layer. The approach is applicable in gate array technology and in custom design provided number of macros is large and the sizes of macros are essentially smaller than the size of the chip.

Author

*Layouts; Very Large Scale Integration; Wiring; Arrays*

**20060003716** Belgrade Univ., Macedonia

**Qualitative Analysis Of Responses For A Class Of Nonlinear Time-Varying Forced Networks**

Milic, Mirko M.; Bajic, Vladimir B.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 815-818; In English; See also 20060003631; Copyright; Avail.: Other Sources

Using Liapunov function of Rosenbrock type BIBO stability, final boundedness, exponential boundedness and unboundedness of response for a class of nonlinear time-varying RLC networks are obtained. Conditions for these response properties are given in terms of suitable constraints on network matrices and network elements.

Author

*RLC Circuits; Qualitative Analysis; Liapunov Functions; Stability; Nonlinearity*

**20060003721** Centro Studi e Laboratori Telecomunicazioni, Turin, Italy

**Two-Dimensional Stability Analysis Using The Complex Cepstrum**

Garibotto, G.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 868-871; In English; See also 20060003631; Copyright; Avail.: Other Sources

A new stability test for two-dimensional digital filters is proposed. It is based on the analysis of the phase function in order to detect possible discontinuities of  $\pi$  which would confirm the filter instability. The frequency regions which are involved in this local analysis are determined by comparing the differences between the principal value of the phase of the denominator polynomial and the imaginary part of its cepstrum frequency response. In this way phase unwrapping is performed in a very efficient way. Numerical examples are referred to demonstrate the usefulness of this approach.

Author

*Stability Tests; Frequency Response; Digital Filters; Algorithms; Cepstral Analysis*

**20060003723** Xerox Corp., El Segundo, CA, USA

**A Chip Design Methodology For A Class Of Pipelined Computations**

Krishnan, M. S.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 895-898; In English; See also 20060003631; Copyright; Avail.: Other Sources

This paper describes a chip design methodology for a useful class of pipelined architectures that can include some data-dependent branches. The objective of the method is to produce a structured chip design in a manner that integrates the logic design and layout design for pipelined computations. A set of functional operators and a set of structural operators are proposed. The class of computations realizable using these sets of operators is then characterized in terms of the structure of these computations. A complete chip design algorithm for such computations is presented.

Author

*Chips; Logic Design; Algorithms*

**20060003724** Imperial Coll. of Science and Technology, London, UK

**Analysis Of 1-D Digital Filter Structures**

Constantinides, A. G.; Kwan, H.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1233-1236; In English; See also 20060003631; Copyright; Avail.: Other Sources

In this paper, we present a simplified matrix representation (SMR) of 1-D digital filters. We then briefly describe the use of this SMR for various time and frequency domain analyses. Computational results demonstrate that considerable improvement in both computer execution time and storage in time domain analysis along with great improvement in both

computer execution time and storage in various frequency domain analyses are obtained compared with those obtained without the SMR.

Author

*Digital Filters; Electrical Engineering*

**20060003725** Melbourne Univ., Victoria, Australia

**Elementary Limit Cycles With Application To The Testing Of Digital Circuits**

Adams, K. M.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1237-1240; In English; See also 20060003631; Copyright; Avail.: Other Sources

Patterns of simple limit cycles that occur in first-order systems are investigated and classified in accordance with elementary number theory. The simplest of these result in input-output patterns that enable rapid verification of the correct functioning of simple combinations of adders and multipliers. Necessary and sufficient conditions at constant input for the following situations have been obtained: (i) a unique constant solution; (ii) a limit cycle of period 2 samples and of magnitude equal to  $m$  (integer), with  $m=1$  the most useful case; (iii) multiple constant solutions occurring in simple clusters; (iv) multiple limit cycles of type (ii) encircling a constant solution. Type (ii) provides the most useful results.

Author

*Logic Circuits; Electrical Engineering*

**20060003726** San Jose State Univ., San Francisco, CA, USA

**A New Z Domain Continued Fraction Expansion**

Davis, Artice, M.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 903-906; In English; See also 20060003631; Copyright; Avail.: Other Sources

A new Z domain continued fraction expansion is presented which proceeds in terms of  $z^{-1}$  and  $1-z(\exp^{-1})$  factors. It is proved to be always convergent for polynomials whose roots all lie within the unit circle. The procedure involves a unique decomposition of the given polynomial into an MIP and an AMIP whose degrees differ by unity. The ratio of these polynomials is shown to possess the properties of a digital reactance function. The continued fraction expansion developed here, due to the fact that  $z^{-1}$  and  $1-z(\exp^{-1})$  are the inverse transmittances of digital accumulators, as well as of switched capacitor integrators, has application to the synthesis of digital and switched capacitor ladder filters.

Author

*Convergence; Polynomials; Decomposition; Integrators; Circles (Geometry); Capacitors*

**20060003727** Bell Telephone Labs., Inc., Holmdel, NJ, USA

**A Digital Carrier Regenerator Applicable To TDMA Satellite Systems**

Vannucci, G.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1249-1252; In English; See also 20060003631; Copyright; Avail.: Other Sources

We describe a digital technique to recover the carrier phase in nonreal time, using stored, digitized samples of the received signal. The stored signal can then be demodulated in nonreal time using the recovered phase, through digital processing. This technique is particularly suited to Time Division Multiple Access (TDMA) satellite systems, where the bursty nature of transmission allows the use of non-real-time processing at rates considerably lower than transmission rates. It is especially useful with systems that must operate at the very low Carrier-to-Noise-Ratio (CNR) levels occurring during rain fades (as low as 0 dB) where the performance of conventional analog techniques is greatly impaired. In particular, we compare the performance of our technique at 0 dB CNR with that of modulation wipeoff (a more conventional technique used in TDMA systems) and find a better than 3 to 1 reduction in the length of the required sequence, which allows a 2 to 1 reduction in the total length of the preamble. More important, in systems employing soft-decision Viterbi decoding to operate at the low CNR level, the extra hardware needed is relatively minor compared to conventional analog techniques.

Author

*Digital Techniques; Time Division Multiple Access*

**20060003729** Ecole Nationale Supérieure d'Electricité et de Mécanique, Nantes, France

**Invariant Factors And Feedback Control**

Kucera, Vladimir; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 927-930; In English; See also 20060003631; Copyright; Avail.: Other Sources

The problem of modifying the dynamics of a linear system by state feedback is studied with the implications for linear

optimal control. In particular, a construction of linear regulators, optimal estimators and deadbeat controllers is reduced here to the problem of pole placement. The construction is based on the solution of a linear equation with polynomial matrices. This approach provides further insight, high degree of uniformity, and bridges the state-space and transfer-function techniques.

Author

*Feedback Control; Linear Systems; Optimal Control; Polynomials; Matrices (Mathematics)*

**20060003730** Schlumberger-Doll Research, Ridgefield, CT, USA

#### **Markovian Representation Theory And Hardy Spaces**

Ruckebusch, Guy; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 931-934; In English; See also 20060003631; Copyright; Avail.: Other Sources

This paper reviews some highlights of Markovian Representation Theory. It is shown that the Hilbert space is the natural framework to study the theory with no dimensionality restriction on the Representations. To achieve the greatest generality as well as clarity, emphasis has been put on deriving the results with the minimum set of assumptions. With the basic geometric framework, the set of all Markovian Representations can be determined. Furthermore, the concepts of Minimality, Observability and Constructibility can be defined by analogy with System Theory. When the Hilbert space satisfies the 'strict noncyclicity' assumption, the study of the Markovian Representations can be refined by means of functional models in the Hardy space. Connections are then shown with Scattering Theory and the Realization Theory in Hilbert space.

Author

*Hilbert Space; Systems Analysis; Scattering*

**20060003731** Harris Corp., San Carlos, CA, USA

#### **Microwave Communications Technology**

Ivanek, Ferdo; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 938-944; In English; See also 20060003631; Copyright; Avail.: Other Sources

Microwave technology is discussed from the viewpoint of communications, which quantitatively leads all other microwave applications. The focus is on hardware implementations of the major equipment functions: generation, amplification, frequency conversion, modulation, and adaptive techniques. The concluding discussion of technological prospects concentrates on the impact of monolithic microwave integrated circuits (MMIC). represents the response to an identified need, chosen under the existing competitive conditions. This paper concentrates on the largest population of microwave communication equipment: high-capacity, long-distance terrestrial radio-relay systems. Technological commonality with the corresponding satellite communications systems is also included as indicated.

Author

*Microwave Circuits; Communication Satellites; Satellite Communication; Microwave Equipment*

**20060003732** Belgrade Univ., Belgrade, Yugoslavia

#### **Lowpass Prototype Functions for Delay Equalized Microwave Filters With Transmission Zeros At Real And Imaginary Frequencies**

Rakovich, Branko D.; Radmanovic, Milan Dj.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 953-956; In English; See also 20060003631; Copyright; Avail.: Other Sources

A method is presented to determine lowpass prototype networks with one positive and one negative crosscoupling from which, after lowpass-to-bandpass transformation, delay equalized narrow bandpass filters can be obtained. Two different solutions are derived and compared. In one of them, the zero passband loss is approximated in terms of a weighted least-mean-squares norm, while the other yields an exact equal ripple passband magnitude response.

Author

*Microwave Filters; Bandpass Filters; Ripples; Mean Square Values; Prototypes*

**20060003733** Technical Univ. of Budapest, Hungary

#### **Lumped Network Models of a Class of Distributed Systems**

Zombory, Laszlo; 1982 International Symposium on Circuits And Systems, Volume 3; [1982]; See also 20060003631; Copyright; Avail.: Other Sources

A unified modelling procedure applicable for a wide variety of different distributed systems is introduced. The common of the different systems is introduced. The common of the different systems i.e. that they are interconnected to the environment via finite number of ports excited by extensive (potential-like) quantities; their (linear) governing operators are self-adjoint

with homogeneous boundary conditions i.e. zero excitation. The procedure leads to two canonical forms of lumped models the admittance parameters of which approach those of the distributed systems up to an arbitrarily high prescribed order. Three different examples illustrate the method: in-homogeneous transmission lines and related systems; coupled homogeneous transmission lines; two-dimensional distributed RC-networks.

Author

*Linear Operators; Transmission Lines; Canonical Forms*

**20060003735** Tufts Univ., Medford, MA, USA

**High Speed Pulse Propagation In Integrated Circuits: Limitations And Equalization**

Preis, D.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1180-1185; In English; See also 20060003631; Copyright; Avail.: Other Sources

This report deals with some fundamental physical limitations impeded on pulse propagation along signal paths in integrated circuits and compensation of pulse distortion using minimax time domain equalization. The electrical transmission properties of discrete and continuously distributed resistance-capacitance signal-path models are investigated. Both time-domain and frequency domain responses are evaluated analytically and presented in normalized forms valid for arbitrary path lengths and electrical parameters. These equations and curves predict significant frequency dependent attenuation and delay. In the time domain, impulse response peak time and pulse width as well as step response rise time are quantitatively related to signal-path properties. Because the signal path necessarily and unavoidably induces pulse distortion, the possibility of predistorting transmitted pulses or equalizing received pulses is considered. Computed numerical results are given to illustrate time-domain equalization of a typically dispersed pulse using a transversal-filter equalizer.

Author

*High Speed; Integrated Circuits; Pulse Duration; Mathematical Models*

**20060003737** Thales Research and Technology, Orsay, France

**Digital Processing In A 32 Kbit/s ADPCM Encoder For Telephone Channels**

Raulin, Jean-Marie; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1253-1255; In English; See also 20060003631; Copyright; Avail.: Other Sources

A 32 kbit/s ADPCM encoder for telephone channels is presented with special emphasis on the digital processing operations involved. The main system features are the high level of transmission quality achieved, the moderate computational complexity and some special useful properties like the non accumulation of degradations in digital tandem connections. Adaptive techniques are employed for both quantization and signal prediction. The prediction filter consists in a cascade of 5 second order sections suitably interconnected. The adaptation algorithms use a simplified gradient method. In the digital implementation with finite arithmetic special care is taken to reach the above mentioned synchronizing property. The encoder is able to handle all the signals Present in a telephone channel, including speech and high speed data, with an excellent level of quality.

Author

*Coders; Telephones; Adaptation; Algorithms; Pulse Communication*

**20060003738** Carnegie-Mellon Univ., Pittsburgh, PA, USA

**An Event Driven Approach For Mixed Gate And Circuit Level Simulation**

Sakallah, K. A.; Director, S. W.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1194-1197; In English; See also 20060003631

Contract(s)/Grant(s): DAAG29-79-0213; Copyright; Avail.: Other Sources

A new algorithm for mixed gate and circuit level simulation is described. The algorithm-is based on a modular view of electronic networks in which individual modules may be described either at the circuit or at the logic level. Consistency is ensured by employing a novel logic gate model which is derived by abstraction from the underlying (and more detailed) circuit model. Computational efficiency is achieved by exploiting temporal sparseness - both for circuit and logic level modules - through the use of event driven techniques. The implementation of the algorithm in the SAMSON program is briefly described and a sample simulation example is presented.

Author

*Algorithms; Circuit Diagrams; Logic Circuits; Computerized Simulation; Communication Networks*

**20060003739** Eindhoven University of Technology, Eindhoven, Netherlands

**Mixed-Level And Mixed-Mode Simulation By A Piecewise-Linear Approach**

van Bokhoven, W. M. G.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1256-1258; In English; See also 20060003631; Copyright; Avail.: Other Sources

There is a continuously increasing demand systems due to their improved reliability, growing complexity and reduction in power consumption and Costs. Since these electronic systems mostly deal with combined analog and digital signal processing, the circuit-design task becomes very complex and requires the availability of accurate mixed-mode simulation methods in order to be able to complete the design. These mixed-mode methods are often a combination of analog and digital simulators which employ different algorithms and models and which are linked by a suitable interface to transfer data between each of them. This yields a complicated data structure and now and then unstable solution method with serious drawbacks in application as well as leading to large difficulties when trying to extend the simulation task. In contrast with the above, the application of piecewise-linear simulation methods allows for a uniform modelling and analysis and appears to be easily extendable.

Author

*Mathematical Models; Digital Simulation; Algorithms*

**20060003744** Eindhoven University of Technology, Eindhoven, Netherlands

**Piecewise Linear Modelling In The Simulation Of Electronic Networks**

vanEijndhoven, J. T. J.; vanBokhoven, W. M. G.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1206-1209; In English; See also 20060003631; Copyright; Avail.: Other Sources

Recently a new method to describe piecewise linear (PL-) systems has been proposed, which may serve as the key to a new simulation method. This method has a number of advantages over conventional simulation methods. For instance, mixed mode and mixed level simulation are performed easily when mathematical models for various electronic components are available. In this paper the construction of two specific PL-models is discussed to demonstrate the general modelling process. In the first example the macromodelling capabilities are shown by modelling an A/D converter. In the second example a PL-version of the Gummel-Poon transistor model is presented, which shows that detailed low level analysis can also be performed.

Author

*Linear Systems; Mathematical Models; Simulation; Electronics; Communication Networks*

**20060003745** Waseda Univ., Tokyo, Japan

**Minimum Dissection Of Rectilinear Regions**

Ohtsuki, Tatsuo; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1210-1213; In English; See also 20060003631

Contract(s)/Grant(s): MOE 56550234; Copyright; Avail.: Other Sources

This paper deals with the problem of dissecting a digitized rectilinear region into a minimum number of non-overlapping rectangles. The region is bounded by horizontal and vertical line segments, and may contain 'windows'. This problem arises in applications such as manipulation of VLSI mask data and image processing. Two algorithms for solving this problem are presented. The first one is to partition a non-degenerate rectilinear region into a minimum number of rectangles, where a rectilinear region is degenerate if a line-segment connecting two co-horizontal concave vertices is totally included in it, otherwise it is nondegenerate. The second one is to optimally decompose a given (degenerate) rectilinear region into a number of non-degenerate subregions. The first algorithm runs in  $O(n \log n)$  time and second one in  $O(n \sup 5/2)$  time, where  $n$  is the number of vertices of the rectilinear region being considered.

Author

*Dissection; Rectangles; Algorithms*

**20060003746** California Univ., Santa Barbara, CA, USA

**A General Theory Of Block-State Digital Filters**

Ananthakrishna, Padma; Mitra, Sanjit K.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1025-1028; In English; See also 20060003631; Copyright; Avail.: Other Sources

This paper is concerned with the block implementation of scalar linear time-invariant recursive digital filters, specifically, blockstate structures. New block-state structures, for block lengths less than the order of the scalar transfer function, are developed. A simple method of reducing the block-state structures to the minimal form is outlined. Unification of the different

types of block-state structures is also considered. These structures are then compared with the conventional state space realizations, with regard to computational complexity, and it is shown that the block-state structures are superior.

Author

*Digital Filters; State Vectors; Scalars*

**20060003747** Toshiba Corp., Kawasaki, Japan

**Logical Verification Of LSI Mask Artwork By Mixed Level Simulation**

Kawamura, Masahiko; Hirabayaashi, Kanji; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1021-1024; In English; See also 20060003631; Copyright; Avail.: Other Sources

This paper describes an efficient logical verification method of MOS LSI mask using mixed level simulation. Gate level components are extracted from the transistor level circuit data which are obtained from mask artwork data. Furthermore function level components are extracted from the circuit data including both transistor level and gate level components. The circuit data after the extraction are then input to the simulation program MACLOS for the logical verification of LSI mask. The simulation efficiency is demonstrated for several LSI products.

Author

*Large Scale Integration; Proving; Transistor Circuits; Iteration; Extraction; Transistors*

**20060003748** Telettra S.p.A., Vimercate, Italy

**Half-Band Digital Filters With Finite Length Coefficients**

Molo, Francesco; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1033-1036; In English; See also 20060003631; Copyright; Avail.: Other Sources

In the first part of the paper some new formulae and considerations on monotonic (maximally flat) half band FIR digital filters are presented. A design procedure for a more general type (nearly Chebyshev behaviour) of half-band filters is then given; the procedure is applicable to filters of not too high degree and allows a tight control on coefficient length during the design, and some tradeoff between coefficient length and attenuation requirement agreement. Finally a slight deviation from half-band filter frequency response behaviour is considered, which can allow a further reduction in coefficient length. Some computational examples are given, including the application to a set of FIR filters used in a 60 channel transmultiplexer structure.

Author

*Digital Filters; Chebyshev Approximation; Coefficients; Frequency Response*

**20060003749** Technische Hochschule, Stuttgart, Germany

**Fast Digital Filters Without Multipliers**

Lueder, E.; Hoefer, K.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1037-1040; In English; See also 20060003631; Copyright; Avail.: Other Sources

Multipliers are the most costly and slowest components in digital filters. In new 2nd order digital structures with five nodes a full-fledged multiplication is replaced by such a one with factors integer. This can be realized with hard wired shifters by bits followed by adders. A PCM-lowpass with 50 Hz suppression implemented in this technique processes with present technology signals 30 times faster than filters with time multiplexed multipliers. New equivalent 2nd order filter structures A model filter, such as one of the canonic forms, can be subjected to a linear transformation yielding a great variety of equivalent structures which all exhibit the same 2nd order transfer function.

Author

*Digital Filters; Linear Transformations; Transfer Functions; Integers*

**20060003750** California Univ., Berkeley, CA, USA

**Dynamics of a Piecewise-Linear Resonant Circuit**

Chua, L. O.; Hasler, M.; Neirynck, J.; Verburgh, Ph.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1057-1061; In English; See also 20060003631; Copyright; Avail.: Other Sources

The qualitative nature of the time evolution in a piecewise-linear lossy resonant circuit driven by a sinusoidal voltage source is investigated by computer-aided analysis using exact analytical formulas. A surprising wealth of different non-linear phenomena is discovered. They are: stable and unstable harmonics, subharmonics, and even apparently completely disordered aperiodic 'chaotic' motions. In the latter case, the hyperbolicity, strange attractor, and broadband frequency spectrum normally associated with chaotic motions have all been observed using nearly exact piecewise-linear solutions. These results represent

the most reliable numerical confirmation to date of chaotic motions in a real physical circuit.

Author

*Circuits; Computer Techniques; Linear Circuits; Frequency Distribution*

**20060003751** Engineering Coll., Opole, Poland

**An Inverter of a Nonlinear Circuit with Hysteresis Loops**

Wroblewski, Jerzy; Ruey-wen, Liu; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1070-1073; In English; See also 20060003631; Copyright; Avail.: Other Sources

In analog measuring systems, for instance in transmission line protection, measuring transformers must faithfully reproduce the input signals, especially during transient state. However, the input signals are distorted by the transformers, particularly on account of iron-core saturation. The paper describes a mathematical model of the measuring transformers with hysteresis loops and the inverter algorithms to reconstruction on-line of the primary signals. The results of the computer simulation study of the transformer-inverter systems and the errors of the reconstruction are shown.

Author

*Inverters; Hysteresis; Loops; Nonlinearity; Circuits; Transmission Lines; Systems Engineering; Signal Processing; Analog Data*

**20060003753** Bell Telephone Labs., Inc., Holmdel, NJ, USA

**Practical Design Considerations For Coupled-Single-amplifier- Biquad Active Bandpass Filters**

Tow, J.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1074-1077; In English; See also 20060003631; Copyright; Avail.: Other Sources

This paper presents a general synthesis method and practical design considerations for the Coupled-Single-Amplifier-Biquad (CSAB) realization of all-pole symmetrical bandpass (BP) filters. The CSAB topology consists of a cascade of second-order SAB bandpass sections together with negative feedback around adjacent sections. A straightforward procedure which leads to the block diagram representation of the CSAB is shown. Explicit design formulas for the optimum element values of the Deliyannis-Friend SAB bandpass section as well as the feedback resistors are given. The effects on the filter response due to finite op am gain, capacitor dissipations, noninfinite pole-Q sections, and their compensation techniques are described. These are followed by discussions on maximizing the filter dynamic range and tuning. The CSAB approach uses the same number of op amps as that of the cascade SAB approach. This number is equal to  $n$  for a  $2n$ -order BP filter and is approximately half the number required by the many inductance simulation techniques.

Author

*Bandpass Filters; Capacitors; Dissipation; Dynamic Range; Resistors; Block Diagrams*

**20060003755** Patras Univ., Greece

**Sensitivity And Noise Considerations In The Cascade Of Biquartic Sections Filter**

Fotopoulos, S.; Deliyannis, T.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1102-1105; In English; See also 20060003631; Copyright; Avail.: Other Sources

The method of realizing high-order filter functions by the cascade connection of biquartic sections is further studied with regard to sensitivity and noise. The sensitivity is obtained using the Monte Carlo method. Two types of biquads, SABs and two-opamp biquads are employed in the realization of the biquartic sections and resulting filters are compared to the corresponding Shifted-Companion-Form and Cascade of Biquadratic Sections filters. The study through the realization of an 8th-and a 12th-order bandpass functions favours the Cascade of biquartic sections filters.

Author

*Sensitivity; Filters; Cascade Control*

**20060003756** Universidade Federal do Rio de Janeiro, Brazil

**Generation Of Zero-Sensitivity Active Filters**

Diniz, Paulo S. R.; Caloba, Luiz P.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1110-1113; In English; See also 20060003631; Copyright; Avail.: Other Sources

This paper presents methods to generate active filters which are virtually independent of the operational amplifiers finite gain  $A(s)$ . The zero sensitivity active filters are easily generated from the well known single-amplifier biquadratic filters. Two

kinds of zero sensitivity active filters are analyzed and compared. Computational results are given to verify the theory.

Author

*Sensitivity; Filters*

**20060003757** Bari Univ., Italy

**A New Method Of Amplitude And/Or Phase Curve Shaping**

Colonnese, Giulio; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1114-1116; In English; See also 20060003631; Copyright; Avail.: Other Sources

With this work a method is introduced which determines network structures for assigned amplitude and/or phase response curves. This method differs from the classical ones, and is based on a pair of simple matrices. The signal is issued at the input of the first matrix, and emerges at the  $n$  outputs of the second matrix, subdivided into its sinusoidal components. The shaping is then done by simple means on each component. Advantageous features are indicated.

Author

*Frequency Response; Phase Shift; Curves*

**20060003759** Imperial Coll. of Science and Technology, London, UK

**A Statistical Fault Isolation Algorithm For Linear And Nonlinear Toleranced Analogue Systems**

Huanca, J.; Spence, R.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1148-1151; In English; See also 20060003631; Copyright; Avail.: Other Sources

A simple statistically-based algorithm is presented for the isolation of a single soft fault in an analog circuit. Normal production tolerances are assumed for the non-faulty components. Faults are characterized by statistical parameters, and a number of responses are evaluated for each faulty component, from these the diagnostic responses are selected. The selection procedure is based on either Analysis of Variance or Eigenanalysis. In the field, diagnostic responses are measured for the faulty circuit, and isolation is performed by using the so-called Mahalanobis distance. The algorithm has been tested on a 7-component circuit with satisfactory results.

Author

*Algorithms; Analog Circuits; Nonlinear Systems; Electrical Faults*

**20060003763** McMaster Univ., Hamilton, Ontario, Canada

**Nodal Approach to Multiple-Fault Location in Analog Circuits**

Starzyk, J. A.; Bandler, J. W.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1136-1139; In English; See also 20060003631

Contract(s)/Grant(s): NSERC A72339; Copyright; Avail.: Other Sources

The multiple-fault location problem for analog circuits is treated on the basis of nodal equations. The availability of the voltage measurements due to current excitations is assumed by the method. Topological restrictions on the possibility of fault location for a given set of measurements are formulated. The emphasis in this paper is on locating subnetworks or regions containing all the faults of the network. Coates flow-graph representation of a network is used for topological considerations.

Author

*Analog Circuits; Equations; Algorithms*

**20060003765** McMaster Univ., Hamilton, Ontario, Canada

**Fault Isolation in Linear Analog Circuits Using the  $L(1)$  Norm**

Bandler, J. W.; Biernacki, R. M.; Salama, A. E.; Starzyk, J. A.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1140-1143; In English; See also 20060003631

Contract(s)/Grant(s): A7239; Copyright; Avail.: Other Sources

This paper deals with fault isolation in linear analog circuits under an insufficient number of independent voltage measurements. The  $L(1)$  norm is utilized in isolating the most likely faulty elements. Earlier work is extended by allowing measurements to be taken for more than a single excitation. An iterative procedure is followed in which we utilize linear programming as a powerful tool in solving the problem. Convergence is fast and the results of circuit examples subject to practical tolerances on components are much sharper than in our earlier method.

Author

*Analog Circuits; Faults; Linear Circuits; Electrical Measurement*

## FLUID MECHANICS AND THERMODYNAMICS

Includes fluid dynamics and kinematics and all forms of heat transfer; boundary layer flow; hydrodynamics; hydraulics; fluidics; mass transfer and ablation cooling. For related information see also *02 Aerodynamics*.

**20060002784** California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA, National Energy Technology Lab., Pittsburgh, PA USA

### **Methane Hydrate Formation and Dissociation in a Partially Saturated Sand--Measurements and Observations**

Taylor, C. E.; Gupta, A.; Kneasfsey, T. J.; Tomutsa, L.; Moridis, G. J.; January 2005; 12 pp.; In English

Report No.(s): DE2005-842697; No Copyright; Avail.: Department of Energy Information Bridge

We performed a sequence of tests on a partially water-saturated sand sample contained in an x-ray-transparent aluminum pressure vessel that is conducive to x-ray computed tomography (CT) observation. These tests were performed to gather data for estimation of thermal properties of the sand/water/gas system and the sand/hydrate/water/gas systems, as well as data to evaluate the kinetic nature of hydrate dissociation. The tests included mild thermal perturbations for the estimation of the thermal properties of the sand/water/gas system, hydrate formation, thermal perturbations with hydrate in the stability zone, hydrate dissociation through thermal stimulation, additional hydrate formation, and hydrate dissociation through depressurization with thermal stimulation. Density changes throughout the sample were observed as a result of hydrate formation and dissociation, and these processes induced capillary pressure changes that altered local water saturation.

NTIS

*Hydrates; Methane; Dissociation; Thermodynamics*

**20060002856** Lawrence Livermore National Lab., Livermore, CA USA

### **Effects of Initial Conditions on Compressible Rayleigh-Taylor Instability and Transition to Turbulence**

Miles, A. R.; Edwards, M. J.; Greenough, J. A.; Jan. 12, 2004; 30 pp.; In English

Report No.(s): DE2005-15013929; UCRL-CONF-201776; No Copyright; Avail.: National Technical Information Service (NTIS)

Perturbations on an interface driven by a strong blast wave grow in time due to a combination of Rayleigh-Taylor, Richtmyer-Meshkov, and decompression effects. In this paper, we present the first results from a computational study of such a system under drive conditions to be attainable on the National Ignition Facility. Using the multiphysics, AMR, higher order Godunov Eulerian hydrocode, Raptor, we consider the late nonlinear instability evolution for multiple amplitude and phase realizations of a variety of multimode spectral types. We show that compressibility effects preclude the emergence of a regime of self-similar instability growth independent of the initial conditions by allowing for memory of the initial conditions to be retained in the mix-width at all times. The loss of transverse spectral information is demonstrated, however, along with the existence of a quasi-self-similar regime over short time intervals. The initial conditions are shown to have a strong affect on the time to transition to the quasiself-similar regime.

NTIS

*Taylor Instability; Turbulence*

**20060002966** Lawrence Livermore National Lab., Livermore, CA USA

### **Parallelization of an Unstructured Grid, Hydrodynamic-Diffusion Code**

Shestakov, A. I.; Milovich, J. L.; January 2005; 18 pp.; In English

Report No.(s): DE2005-2590; UCRL-JC-130862; No Copyright; Avail.: Department of Energy Information Bridge

We describe the parallelization of a three dimensional, unstructured grid, finite element code which solves hyperbolic conservation laws for mass, momentum, and energy, and diffusion equations modeling heat conduction and radiation transport. Explicit temporal differencing advances the cell-based gasdynamic equations. Diffusion equations use fully implicit differencing of nodal variables which leads to large, sparse, symmetric, and positive definite matrices. Because of the unstructured grid, the off-diagonal non-zero elements appear in unpredictable locations. The linear systems are solved using parallelized conjugate gradients. The code is parallelized by domain decomposition of physical space into disjoint subdomains (SDS). Each processor receives its own SD plus a border of ghost cells. Results are presented on a problem coupling hydrodynamics to non-linear heat conduction.

NTIS

*Diffusion; Hydrodynamics; Parallel Processing (Computers); Unstructured Grids (Mathematics)*

**20060002976** Lawrence Livermore National Lab., Livermore, CA USA

**Jet Propagation through Energetic Materials**

Pincosy, P.; Poulsen, P.; Jan. 09, 2004; 14 pp.; In English

Report No.(s): DE2005-15013724; UCRL-PROC-201756; No Copyright; Avail.: National Technical Information Service (NTIS)

In applications where jets propagate through energetic materials, they have been observed to become sufficiently perturbed to reduce their ability to effectively penetrate subsequent material. Analytical calculations of the jet Bernoulli flow provides an estimate of the onset and extent of such perturbations. Although two-dimensional calculations show the back-flow interaction pressure pulses, the symmetry dictates that the flow remains axial. In three dimensions the same pressure impulses can be asymmetrical if the jet is asymmetrical. The 3D calculations thus show parts of the jet having a significant component of radial velocity. On the average the downstream effects of this radial flow can be estimated and calculated by a 2D code by applying a symmetrical radial component to the jet at the appropriate position as the jet propagates through the energetic material. We have calculated the 3D propagation of a radio graphed TOW2 jet with measured variations in straightness and diameter. The resultant three-dimensional perturbations on the jet result in radial flow, which eventually tears apart the coherent jet flow. This calculated jet is compared with jet radiographs after passage through the energetic material for various material thickness and plate thicknesses. We noted that confinement due to a bounding metal plate on the energetic material extends the pressure duration and extent of the perturbation.

NTIS

*Jet Flow; Explosives*

## 35

### INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography. For aerial photography see *43 Earth Resources and Remote Sensing*. For related information see also *06 Avionics and Aircraft Instrumentation*; and *19 Spacecraft Instrumentation and Astrionics*.

**20060002850** Lawrence Livermore National Lab., Livermore, CA USA

**Final Report on ASU Research Funded through Lawrence Livermore National Laboratory Grant ASU XAJ9991/CO**

Calhoun, R.; Sommer, J.; Jan. 22, 2004; 26 pp.; In English

Report No.(s): DE2005-15013874; UCRL-TR-201947; No Copyright; Avail.: National Technical Information Service (NTIS)

The line of inquiry which the ASU lidar group has been investigating, with collaboration and support from LLNL, is to create approaches and algorithms for better utilizing the rich information available through modern remote sensors in dispersion modeling systems. In particular, our goal is to create a lidar-data-driven dispersion model mode in ADAPT/LODI. This report describes progress towards this goal during the 2002/2003 academic year. Because of the nature of lidar data and the necessity to utilize additional information, both numerical and measured, this is essentially a data retrieval and data fusion project. With the current generation of commercially available lidar, the scope of the domain in which we are interested is initially to 14 kilometers in radius, where the potentially scanned domain is roughly hemispherical. Figure 1, for example, taken from a recent lidar deployment in Oklahoma City, shows visually the most typical range of the domain that can be probed with the ASU lidar. Ranges 2 or 3 times the distance to the cluster of buildings in the photograph can be probed with a properly functioning, commercially available lidar. This could be of significant value for protecting key buildings with roof-top located remote sensors coupled with dispersion models.

NTIS

*Optical Radar; Remote Sensors*

**20060002851** Lawrence Livermore National Lab., Livermore, CA USA

**SPEIR: A Ge Compton Camera**

Mihailescu, L.; Vetter, K. M.; Burks, M. T.; Hull, E. L.; Craig, W. W.; Mar. 01, 2004; 34 pp.; In English

Report No.(s): DE2005-15013886; UCRL-TR-202620; No Copyright; Avail.: Department of Energy Information Bridge

No abstract available

*Cameras; Imaging Techniques*

**20060003063** Illinois Univ., Urbana, IL, USA

**Comparison of Phase Retrieval Algorithms**

Huang, T. S.; Rinaldi, K. A.; Lee, H.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 1199-1200; In English; See also 20060003045

Contract(s)/Grant(s): N0014-85 C 0149; Copyright; Avail.: Other Sources

Three algorithms for support-limited phase retrieval from Fourier magnitude are compared by computer simulation using small test arrays. It was found that Fienup's hybrid input-output algorithm is superior in terms of both computer time requirement and noise sensitivity.

Author

*Algorithms; Image Processing; Image Reconstruction*

**20060003064** North Carolina State Univ., Raleigh, NC, USA

**Considerations for the Restoration of Stochastic Degradations**

Trussell, H. Joel; Combettes, Patrick L.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 28.9.1 - 28.9.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

This paper presents a technique for restoring images which have been degraded by a stochastic point spread function (psf). In the past, the restoration of such images has been approached in terms of averages without considering the variations of the psf. It will be shown that the integration of the additional uncertainties caused by the stochastic psf can be used to obtain better estimates. These uncertainties can be included to the restoration scheme in a very flexible manner through the use of the Projection Onto Convex Sets (POCS) method. Finally, the benefits of the method will be illustrated through simulations.

Author

*Stochastic Processes; Image Reconstruction; Restoration*

**20060003106** Eastman Kodak Co., Rochester, NY, USA

**Effects of Constraints, Initialization, and Finite-Word Length in Blind Deblurring of Images by Convex Projections**

Chen, Cheng-Tie; Sezan, Ibrahim M.; Tekalp, Murat A.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 1201-1204; In English; See also 20060003045; Copyright; Avail.: Other Sources

Reconstruction from phase information via convex projections is considered for deblurring smeared images when the blurring function does not introduce any phase. The effects of initialization and constraints in the algorithm are investigated. It is shown by examples that the number of quantization levels when the smeared image is digitized determines the quality of the restored image.

Author

*Image Reconstruction; Convexity*

**20060003109** Tsinghua Univ., Beijing, China

**A New Approach to 2-D Kalman Filtering**

Min, Jiang; Xiang, Chen Su; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 28.15.1 - 28.15.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

A new approach is made to 2-D Kalman filtering, which consists of three parts sequentially. First, we simplify the model of the reduced update kalman filter (RUKF) further. Then, we present a fast recursive least-square identification (FRLSI) to estimate parameters of space-variant images on-line. Finally, we design a generalized likelihood ratio (GLR) edge detector to eliminate the edge smear. Experiment shows that our improvements are feasible in practice and give better results.

Author

*Kalman Filters; Image Processing*

**20060003157** Granger Associates, Santa Clara, CA, USA

**On the Design of Optimal Narrowband and Minimum Phase FIR Filters**

Yang, Paul P. N.; Song, M. S.; Narasimha, M. J.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 21.5.1 - 21.5.3; In English; See also 20060003045; Copyright; Avail.: Other Sources

The design of long narrowband FIR filters is discussed in this paper. Two modifications to the popular McClellan-Parks-Rabiner linear phase filter design program are suggested. The first one is an adaptive scaling scheme in the Lagrange interpolation subroutine to overcome divergence problems. And the other change enables the design of filters with very high

stopband attenuation. Because of their lower absolute delay, minimum phase FIR filters are desirable in certain telecommunications systems. The conversion of a linear phase design to minimum phase through the Herrmann-Schuessler scheme is explored. Solutions are presented to numerical stability problems encountered while using this scheme for the conversion of long filters.

Author

*Fir Filters; Linear Filters; Narrowband*

**20060003193** Rensselaer Polytechnic Inst., Troy, NY, USA

**Effects of Modeling Domains on Recursive Color Image Restoration**

Angwin, Denise L.; Kaufman, Howard; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 28.14.1 - 28.14-3; In English; See also 20060003045

Contract(s)/Grant(s): NSF ECS-83-13889; Copyright; Avail.: Other Sources

Image restoration techniques such as the Reduced Update Kalman Filter, are usually applied to monochromatic images, but can also be applied to the components of color images. It is of interest to consider and compare the restoration of density and intensity representations of the corresponding color components to determine the representation which results in the best restoration. Based on experiments with photographic and simulated blurs, it was concluded that in general, images should be restored in the intensity domain.

Author

*Image Reconstruction; Kalman Filters; Color Photography*

**20060003197** International Business Machines Corp., USA

**Image Reconstruction from One-Bit Fourier Phase: Theory, Sampling, and Coherent Image Model**

Huang, Thomas T.; Sanz, Jorge L. C.; Blanz, W. E.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987; In English; See also 20060003045; Copyright; Avail.: Other Sources

In this paper, we tackle the problem of recovering an image from its Fourier transform phase quantized to 1 bit, or, equivalently, from the zero crossings of the real part of the Fourier transform. We first present new theoretical results that set an algebraic condition under which real zero crossings uniquely specify a band-limited image. We then show, however, through a large-scale set of experiments, that sampling in the frequency domain presents a major obstacle to good reconstruction results due to the information loss produced by the approximated knowledge of the zero crossing locations. We finally show that, by using a 'coherent' image model, in which the image is complex and the spatial-domain phase is random and highly uncorrelated, we can significantly reduce the effect of this information loss and improve the quality of image reconstruction.

Author

*Image Reconstruction; Imaging Techniques*

**20060003202** North Carolina State Univ., Raleigh, NC, USA

**Error Bounds for Iterative Reprojection Methods in Computerized Tomography**

Trussell, Joel H.; Orun-Ozturk, Hatice; Civanlar, Reha M.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 1205-1208; In English; See also 20060003045; Copyright; Avail.: Other Sources

Iterative tomographic reconstruction methods have been developed which can enforce various constraints on the reconstructed image. An important step in these methods is the reprojection of the reconstructed image. A common disadvantage of these methods is they fail to converge due to the accumulation of the reprojection errors. In this paper the errors generated by such reprojection schemes are investigated and bounds for these errors are derived. The approach in deriving the error bounds is probabilistic and the resulting bounds are much smaller than the previously derived maximum bounds.

Author

*Computer Aided Tomography; Tomography*

**20060003203** American Telephone and Telegraph Co., NJ, USA

**ECT Image Enhancement**

Laico, Stephen A.; Sullivan, Barry J.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 1217-1220; In English; See also 20060003045; Copyright; Avail.: Other Sources

Degraded ECT images can be improved through the application of image enhancement techniques. In this paper, three different image enhancement techniques--simple smoothing, 2-dimensional filtering and 1-dimensional filtering of the projection data--are implemented and evaluated for a phantom study. Cross-sectional images of the phantom are reconstructed from the modified projection sets. A goal of producing clearer and more useful images is achieved to varying degrees for each technique. The effects produced by modifying the parameters of the 1-dimensional filter are also investigated.

Author

*Image Enhancement; Imaging Techniques*

## 36

### LASERS AND MASERS

Includes lasing theory, laser pumping techniques, maser amplifiers, laser materials, and the assessment of laser and maser outputs. For cases where the application of the laser or maser is emphasized see also the specific category where the application is treated. For related information see also 76 *Solid-State Physics*.

**20060002868** Lawrence Livermore National Lab., Livermore, CA USA

**FY2002 Progress Summary Program Plan, Statement of Work and Deliverables for Development of High Average Power Diode-Pumped Solid State Lasers, and Complementary Technologies, for Applications in Energy and Defense**

Bayramian, A.; Bibeau, C.; Beach, R.; Behrendt, B.; Ebberts, C.; Dec. 13, 2001; 90 pp.; In English

Report No.(s): DE2005-15013439; UCRL-ID-146643; No Copyright; Avail.: Department of Energy Information Bridge

The High Average Power Laser Program (HAPL) is a multi-institutional, coordinated effort to develop a high-energy, repetitively pulsed laser system for Inertial Fusion Energy and other DOE and DOD applications. This program is building a laser-fusion energy base to complement the laser-fusion science developed by DOE Defense programs over the past 25 years. The primary institutions responsible for overseeing and coordinating the research activities are the Naval Research Laboratory NRL and LLNL. The current LLNL proposal is a companion proposal to that submitted by (NRL), for which the driver development element is focused on the krypton fluoride excimer laser option. Aside from the driver development aspect, the NRL and LLNL companion proposals pursue complementary activities with the associated rep-rated laser technologies relating to target fabrication, target injection, final optics, fusion chamber materials and power plant economics. This report requests continued funding in FY02 to support LLNL in its program to build a 1kW, 100J, diode-pumped, crystalline laser. In addition, research in high gain laser target design, fusion chamber issues in survivability of the final optic element will be pursued. These technologies are crucial to the feasibility of inertial fusion energy power plants and also have relevance in rep-rated stewardship experiments.

NTIS

*Delivery; Diodes; High Power Lasers; Laser Materials; Project Planning; Solid State Lasers*

**20060002871** Brookhaven National Lab., Upton, NY USA

**Optimization of the Dispersive Section Strength in HGHG Free Electron Laser**

Shaftan, T.; Yu, L. U.; Apr. 2005; 8 pp.; In English

Report No.(s): DE2005-15015158; BNL-73868; No Copyright; Avail.: National Technical Information Service (NTIS)

In HGHG FEL the optimum strength of dispersive section is determined by the maximum bunching that beam obtains after interaction with seed laser. In this paper we present a simple semi-analytic expression of the required dispersive section strength for a wide range of laser power, intrinsic energy spread and harmonic number.

NTIS

*Dispersing; Free Electron Lasers*

**20060003754** Gdansk Technical Univ., Poland

**Dynamic Range Extension In II-Order Active Filters Using The MFF-Loop**

Szczepaneki, S.; Guzinski, A.; Tomaszewski, Z.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1098-1101; In English; See also 20060003631; Copyright; Avail.: Other Sources

A method leading to considerable extension of dynamic range in SAB sections is presented. The proposed approach is based on the mixed feedforward-feedback single-loop structure /MFF/ Theoretical as well as experimental results are included which confirm the primary objectives stated and show encouraging prospects for practical usefulness of the concept.

Author

*Dynamic Range; Feedback; Feedforward Control; Block Diagrams*

## MECHANICAL ENGINEERING

Includes mechanical devices and equipment; machine elements and processes. For cases where the application of a device or the host vehicle is emphasized see also the specific category where the application or vehicle is treated. For robotics see 63 *Cybernetics, Artificial Intelligence, and Robotics*; and 54 *Man/System Technology and Life Support*.

**20060002733** Texas Univ., Austin, TX, USA

### Reduced Engine Friction and Wear

Matthews, R.; May 2005; 78 pp.; In English

Report No.(s): DE2005-843071; No Copyright; Avail.: Department of Energy Information Bridge

This Final Technical Report discusses the progress was made on the experimental and numerical tasks over the duration of this project regarding a new technique for decreasing engine friction and wear via liner rotation. The experimental subtasks involved quantifying the reduction in engine friction for a prototype rotating liner engine relative to a comparable baseline engine. Both engine were single cylinder conversions of nominally identical production four-cylinder engines. Hot motoring tests were conducted initially and revealed that liner rotation decreased engine friction by 20% under motoring conditions. A well-established model was used to estimate that liner rotation should decrease the friction of a four-cylinder engine by 40% under hot motoring conditions. Hot motoring tear-down tests revealed that the crankshaft and valve train frictional losses were essentially the same for the two engines, as expected. However, the rotating liner engine had much lower ( $\approx 70\%$ ) piston assembly friction compared to the conventional engine. Finally, we used the Instantaneous IMEP method to compare the crank-angle- resolved piston assembly friction for the two engines. Under hot motoring conditions, these measurements revealed a significant reduction in piston assembly friction, especially in the vicinity of compression TDC when the lubrication regime transitions from hydrodynamic through mixed and into boundary friction. We have some remaining problems with these measurements that we expect to solve during the next few weeks. We will then perform these measurements under firing conditions. We also proposed to improve the state-of-the-art of numerical modeling of piston assembly friction for conventional engines and then to extend this model to rotating liner engines. Our research team first modeled a single ring in the Purdue ring-liner test rig. Our model showed good agreement with the test rig data for a range of speeds and loads. We then modeled a complete piston assembly in an engine. The model appears to produce the correct behavior, but we cannot quantify its strengths or weaknesses until our crank-angle-resolved measurements have been completed. Finally, we proposed and implemented a model for the effects of liner rotation on piston assembly friction. Here, we propose that the rotating liner design is analogous to the shaft-bushing mechanism. Therefore, we used the side-slip rolling friction model to simulate the effects of liner rotation. This model appears to be promising, but final analysis of its strengths and/or weaknesses must await our crank-angle-resolved measurements.

NTIS

*Friction; Linings; Rotation; Wear; Wear Resistance*

**20060002824** Lawrence Livermore National Lab., Livermore, CA USA, California Univ., Berkeley, CA USA

### Operation of a Four-Cycliner 1.9L Propane Fueled HCCI Engine

Flowers, D.; Aceves, S. M.; Martinex-Frias, J.; Smitn, J. R.; Au, M.; January 2005; 18 pp.; In English

Report No.(s): DE2005-15013217; No Copyright; Avail.: Department of Energy Information Bridge

A four-cylinder 1.9 Volkswagen TDI Engine has been converted to run in Homogeneous Charge Compression Ignition (HCCI) mode. The stock configuration is a turbocharged direct injection Diesel engine. The combustion chamber has been modified by discarding the in-cylinder Diesel fuel injectors and replacing them with blank inserts (which contain pressure transducers). The stock pistons contain a reentrant bowl and have been retained for the tests reported here. The intake and exhaust manifolds have also been retained, but the turbocharger has been removed. A heater has been installed upstream of the intake manifold and fuel is added just downstream of this heater.

NTIS

*Diesel Engines; Ignition; Propane*

**20060002992** Bureau of the Census, Washington, DC, USA

### Economic Census 2002: Manufacturing, Industry Series. Gasoline Engine and Engine Parts Manufacturing

Dec. 2004; 52 pp.; In English

Report No.(s): PB2006-103404; EC02-31I-336312(RV); No Copyright; Avail.: CASI: [A04](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191,

and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing and/or rebuilding gasoline motor vehicle engines and gasoline motor vehicle engine parts, excluding carburetors, pistons, piston rings, and valves.

NTIS

*Census; Economic Analysis; Economics; Engine Parts; Gasoline; Industries; Manufacturing*

## 38

### QUALITY ASSURANCE AND RELIABILITY

Includes approaches to, and methods for reliability analysis and control, quality control, inspection, maintainability, and standardization.

**20060003741** Milan Univ., Italy

#### **Linking Centers and Reliable Trees of a Network**

Camerini, P. M.; Maffioli, F.; Galbiati, G.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 972-974; In English; See also 20060003631; Copyright; Avail.: Other Sources

In this work we address two synthesis problems in the general context of unreliable communication networks. The first problem requires to locate a linking center, i.e. a point on a network through which every connection between two given sets of vertices has to pass. This location has to be found in the best way with respect to the maximum reliability of a path connecting through the center of every pair of vertices. The second problem asks for a most reliable tree connecting two given sets of vertices. We propose polynomial time, i.e. fast, algorithms for solving both problems, and show that even simple variants of them are NP-hard, i.e. unlikely to be solved efficiently.

Author

*Communication Networks; Reliability; Trees (Mathematics)*

## 39

### STRUCTURAL MECHANICS

Includes structural element design, analysis and testing; dynamic responses of structures; weight analysis; fatigue and other structural properties; and mechanical and thermal stresses in structures. For applications see *05 Aircraft Design, Testing and Performance*; and *18 Spacecraft Design, Testing and Performance*.

**20060002854** Lawrence Livermore National Lab., Livermore, CA USA

#### **Shear Localization and Failure in Shocked Metals Final Report**

Campbell, G. H.; Garaizar, R. X.; Kumar, M.; Trbotich, D. P.; Stolken, J. S.; Feb. 18, 2004; 14 pp.; In English  
Report No.(s): DE2005-15013902; UCRL-TR-202399; No Copyright; Avail.: Department of Energy Information Bridge

The goal of the project was to understand the effect of shocks on the subsequent mechanical response of metals. The framework revolves around the sequence and timing of events during shock loading. A shock will transmit through a solid at speed of several mm per microseconds. The result of the shock passage is a step change in the velocity of the material. This subsequent velocity will cause deformation in the material that could extend in time to several 10s or 100s of ms after the passage of the shock. How the material responds in this timeframe after shock passage is intimately related to its mechanical properties. The mechanical properties of interest are the stress-strain response, the susceptibility to localization, and the failure process. In short, the shock passes through a material first before it has time to move, however it does send the material into motion that causes mechanical deformation and usually some sort of failure.

NTIS

*Failure; Metals; Position (Location)*

**20060003065** State Univ. of New York, Buffalo, NY, USA

**Order Statistic Last Output Reference Filters**

Fam, Adly T.; Lee, Yong Hoon; Ko, Sung-Jea; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 28.19.1 - 28.19.4; In English; See also 20060003045

Contract(s)/Grant(s): NSF DCI-86-11859; Copyright; Avail.: Other Sources

Median filtering can be viewed as operation that selects a sample from each window close to the last output. This observation results in a new edge preserving smoother called the last output reference (LOR) filter. The LOR filter is similar in function to the median or recursive median filters, but has additional advantages particularly in suppressing impulses. It has been shown that repeated applications of LOR filtering produces a sequence that is invariant to subsequent passes through the same filter. Also, it has been proven that any sequence can be converted to a locally monotone sequence by using a combination of 'forward' and 'backward' LOR filters. When the LOR filter is applied to an actual noisy image, it is shown to perform well.

Author

*IIR Filters; Imaging Techniques; Image Processing*

**43**

**EARTH RESOURCES AND REMOTE SENSING**

Includes remote sensing of earth features, phenomena and resources by aircraft, balloon, rocket, and spacecraft; analysis of remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photography. For related instrumentation see *35 Instrumentation and Photography*.

**20060002808** Nature Conservancy, Arlington, VA, USA, Universidad Austral de Chile, Valdivia, Chile

**Comparison of Three Methods to Project Future Baseline Carbon Emissions in Temperate Rainforest, Curinanco, Chile**

Gonzalez, P.; Lara, A.; Gayoso, J.; Neira, E.; Romero, P.; Jul. 14, 2005; 36 pp.; In English

Report No.(s): DE2005-843087; No Copyright; Avail.: National Technical Information Service (NTIS)

This research indicates that best practices for the projection of baseline carbon emissions include integration of forest inventory and remote sensing tasks from the beginning of the analysis, definition of an analysis area using ecological characteristics, use of standard and widely used geographic information systems (GIS) software applications, and the use of species-specific allometric equations and wood densities developed for local species.

NTIS

*Carbon; Chile; Rain Forests; Projection*

**44**

**ENERGY PRODUCTION AND CONVERSION**

Includes specific energy conversion systems, e.g., fuel cells; and solar, geothermal, windpower, and waterwave conversion systems; energy storage; and traditional power generators. For technologies related to nuclear energy production see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power*; *20 Spacecraft Propulsion and Power*, and *28 Propellants and Fuels*.

**20060002873** Department of Energy, Washington, DC, USA

**2005 Solar Decathlon**

January 2005; 8 pp.; In English

Report No.(s): DE2005-15015159; No Copyright; Avail.: Department of Energy Information Bridge

This brochure describes the Solar Decathlon, an international competition among college and university teams to design, build, and operate the most attractive, energy-efficient, solar-powered house.

NTIS

*Competition; Solar Energy*

**20060002901** National Renewable Energy Lab., Golden, CO USA

**Evaluation of the Energy Performance of Six High-Performance Buildings**

Torcellini, P. A.; Pless, S.; Crawley, D. B.; Apr. 2005; 16 pp.; In English

Report No.(s): DE2005-15016076; NREL/CP-550-38080; No Copyright; Avail.: National Technical Information Service (NTIS)

The energy performance of six high-performance buildings around the USA was monitored and evaluated by the National Renewable Energy Laboratory (NREL). The six buildings include the Visitor Center at Zion National Park, the NREL Thermal Test Facility, the Chesapeake Bay Foundation's Merrill Center, the Big Horn Home Improvement Center, the Cambria Office Building, and the Oberlin College Lewis Center.

NTIS

*Buildings; Energy*

**20060002903** Department of Energy, Washington, DC, USA

**PV FAQs: Does the World Have Enough Materials for PV to Help Address Climate Change**

January 2005; 8 pp.; In English

Report No.(s): DE2005-15016539; No Copyright; Avail.: National Technical Information Service (NTIS)

In the ongoing discussion of what needs to be done to stabilize atmospheric CO<sub>2</sub> by mid-century (Hoffert 1998), one possible option would be to add about 10-20 terawatts (trillion watts, or TW) of photovoltaics (PV) in place of conventional sources. PV would help because, unlike burning fossil fuels, it produces no CO<sub>2</sub>. However, 10-20 TW is an enormous amount of energy. In peak Watts, the way PV installations are generally rated, it is about 50-100 TW<sub>peak</sub> (TW<sub>p</sub>) of PV. Would we have enough materials to make this much PV. As we explain in this PV FAQ, we think our planet has enough feedstock materials for PV to meet the 'TW challenge.'

NTIS

*Climate Change; Photovoltaic Conversion*

**20060002933** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Storage Battery Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-103384; EC02-31I-335911(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing storage batteries.

NTIS

*Census; Economic Analysis; Economics; Industries; Manufacturing; Storage Batteries*

**20060002934** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Primary Battery Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-103385; EC02-31I-335912(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing wet or dry primary batteries.

NTIS

*Census; Economic Analysis; Economics; Industries; Manufacturing; Primary Batteries*

**20060002952** National Renewable Energy Lab., Golden, CO USA

**Using HOMER (TRADE MARK) Software, NREL's Micropower Optimization Model, to Explore the Role of Gen-Sets in Small Solar Power Systems. Case Study: Sri Lanka**

Givler, T.; Lilienthal, P.; May 2005; 36 pp.; In English

Report No.(s): DE2005-15016073; NREL/TP-710-36774; No Copyright; Avail.: Department of Energy Information Bridge

This paper discusses using HOMER Software, National Renewable Energy Laboratory's (NREL's) Micropower Optimization Model, to explore the role of gen-sets in small solar power systems in Sri Lanka.

NTIS

*Sri Lanka; Renewable Energy; Solar Generators*

**20060003035** National Renewable Energy Lab., Golden, CO USA, Colorado Univ., Boulder, CO, USA

**BEopt: Software for Identifying Optimal Building Designs on the Path to Zero Net Energy**

Christensen, C.; Horowitz, S.; Givler, T.; Courtney, A.; Barker, G.; Apr. 2005; 14 pp.; In English

Report No.(s): DE2005-15016068; NREL-CP-550-37733; No Copyright; Avail.: National Technical Information Service (NTIS)

A zero net energy (ZNE) building produces as much energy on-site as it uses on an annual basis--using a grid-tied, net-metered photovoltaic (PV) system and active solar. The optimal path to ZNE extends from a base case to the ZNE building through a series of energy-saving building designs with minimal energy-related owning and operating costs. BEopt is a computer program designed to find optimal building designs along the path to ZNE. A user selects from among predefined options in various categories to specify options to be considered in the optimization. Energy savings are calculated relative to a reference. The reference can be either a user-defined base-case building or a climate-specific Building America Benchmark building automatically generated by BEopt. The user can also review and modify detailed information on all available options and the Building America Benchmark in a linked options library spreadsheet.

NTIS

*Identifying; Energy Conservation; Photovoltaic Conversion*

**20060003036** National Renewable Energy Lab., Golden, CO USA

**International Conference on Solar Concentrators for the Generation of Electricity or Hydrogen. Book of Abstracts**

January 2005; 72 pp.; In English

Report No.(s): DE2005-15016069; No Copyright; Avail.: National Technical Information Service (NTIS)

The International Conference on Solar Concentrators for the Generation of Electricity or Hydrogen provides an opportunity to learn about current significant research on solar concentrators for generating electricity or hydrogen. The conference will emphasize in-depth technical discussions of recent achievements in technologies that convert concentrated solar radiation to electricity or hydrogen, with primary emphasis on photovoltaic (PV) technologies. Very high-efficiency solar cells--above 37%--were recently developed, and are now widely used for powering satellites. This development demands that we take a fresh look at the potential of solar concentrators for generating low-cost electricity or hydrogen. Solar electric concentrators could dramatically overtake other PV technologies in the electric utility marketplace because of the low capital cost of concentrator manufacturing facilities and the larger module size of concentrators. Concentrating solar energy also has advantages for the solar generation of hydrogen. Around the world, researchers and engineers are developing solar concentrator technologies for entry into the electricity generation market and several have explored the use of concentrators for hydrogen production. The last conference on the subject of solar electric concentrators was held in November of 2003 and proved to be an important opportunity for researchers and developers to share new and crucial information that is helping to stimulate projects in their countries.

NTIS

*Abstracts; Conferences; Electricity; Solar Collectors*

## 45

### ENVIRONMENT POLLUTION

Includes atmospheric, water, soil, noise, and thermal pollution.

**20060002749** Bechtel Nevada Corp., Las Vegas, NV, USA

**Nuclear Safety Design Bases for License Application**

Mar. 2005; 114 pp.; In English

Report No.(s): DE2005-841292; No Copyright; Avail.: Department of Energy Information Bridge

The purpose of this report is to identify and document the nuclear safety design requirements that are specific to structures, systems, and components (SSCs) of the repository that are important to safety (ITS) during the preclosure period and to support the preclosure safety analysis and the license application for the high-level radioactive waste (HLW) repository at Yucca Mountain, Nevada. The scope of this report includes the assignment of nuclear safety design requirements to SSCs that are ITS and does not include the assignment of design requirements to SSCs or natural or engineered barriers that are important to waste isolation (ITWI). These requirements are used as input for the design of the SSCs that are ITS such that the preclosure performance objectives of 10 CFR 63.111 (DIRS 156605) are met. The natural or engineered barriers that are important to meeting the postclosure performance objectives of 10 CFR 63.113 (DIRS 156605) are identified as ITWI. Although a structure, system, or component (SSC) that is ITS may also be ITWI, this report is only concerned with providing the nuclear safety requirements for SSCs that are ITS to prevent or mitigate event sequences during the repository preclosure period.

NTIS

*Radiation Protection; Radioactive Wastes; Safety; Waste Management*

**20060002754** National Energy Technology Lab., Pittsburgh, PA USA

**Mercury Control with Advanced Hybrid Particulate Collector**

Zhuang, Y.; Miller, S. J.; May 2005; 238 pp.; In English

Report No.(s): DE2005-842441; No Copyright; Avail.: National Technical Information Service (NTIS)

This project demonstrated at the pilot-scale level a technology that provides a cost-effective technique to control mercury and, at the same time, greatly enhances fine particulate collection efficiency. The technology can be used to retrofit systems currently employing inefficient ESP technology as well as for new construction, thereby providing a solution for improved fine particulate control combined with effective mercury control for a large segment of the U.S. utility industry as well as other industries.

NTIS

*Accumulators; Aerosols; Flue Gases; Particulates; Samplers*

**20060002755** Department of Energy, Las Vegas, NV, USA

**Internal Hazards Analysis for License Application**

Garrett, R. J.; Feb. 2005; 212 pp.; In English

Report No.(s): DE2005-841293; No Copyright; Avail.: Department of Energy Information Bridge

The purpose of this internal hazards analysis is to identify and document the internal hazards and potential initiating events associated with preclosure operations of the repository at Yucca Mountain. Internal hazards are those hazards presented by the operation of the facility and by its associated processes that can potentially lead to a radioactive release or cause a radiological hazard. In contrast to external hazards, internal hazards do not involve natural phenomena and external man-made hazards. This internal hazards analysis was performed in support of the preclosure safety analysis and the License Application for the Yucca Mountain Project. The methodology for this analysis provides a systematic means to identify internal hazards and potential initiating events that may result in a radiological hazard or radiological release during the repository preclosure period.

NTIS

*Hazards; Radiation Hazards*

**20060002760** North Dakota Univ., Grand Forks, ND, USA, Science Museum of Minnesota, Minneapolis, MN, USA

**Subtask 7.2 Global Warming and Greenhouse Gases**

Jan. 2005; 188 pp.; In English

Report No.(s): DE2005-841343; No Copyright; Avail.: Department of Energy Information Bridge

Evaluation of current climatic trends and reconstruction of paleoclimatic conditions for Devils Lake have been conducted based on diatom-inferred salinity for the last 2000 years. The 3-year cross-disciplinary research, funded by the U.S. Department of Energy (DOE) was carried out by the Energy & Environmental Research Center (EERC) and St. Croix Watershed Research Station (SCWRS) at the Science Museum of Minnesota. The results indicate that frequent climatic fluctuations resulting in alternating periods of drought and wet conditions are typical for the northern Great Plains and suggest that the severity and length of extremes exceeded those on modern record. Devils Lake has experienced five fresh periods and two minor freshening periods in the last 2000 years. Transitions between fresh and saline periods have been relatively fast,

representing lake level changes that have been similar to those observed in the last 150 years.

NTIS

*Global Warming; Greenhouse Effect*

**20060002772** Middle Rio Grande Council of Governments of New Mexico, Albuquerque, NM, USA

**Transportation/Air Quality Conformity Finding, 1994**

January 1994; 26 pp.; In English

Report No.(s): PB2006-101462; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The purpose of this report is to document the finding that the transportation plans and programs for the Albuquerque Metropolitan Planning Area (AMPA) are in conformity with the applicable Clean Air Act implementation plans for the nonattainment area of Bernalillo County. Although the AMPA is not coterminous with Bernalillo County, the transportation air quality analysis in this report addresses all of Bernalillo County. Bernalillo County is designated as a moderate nonattainment area for carbon monoxide under the Clean Air Act Amendments of 1990. During 1991 only 1 violation of the National Ambient Air Quality Standards (NAAQS) for carbon monoxide occurred. No violations were recorded in 1992 or thus far in 1993. Based on the emissions inventories, a significant contributor to the problem is pollution resulting from motor vehicle travel. Consequently, it is important that future-year transportation plans and programs contribute to the attainment and maintenance of the NAAQS. The requirement for a conformity finding aids in determining that this contribution is taking place.

NTIS

*Air Pollution; Air Quality; Cities; Pollution Monitoring; Transportation*

**20060002773** Department of Agriculture, Washington, DC USA

**National Management Strategy for Methyl Bromide**

January 2005; 60 pp.; In English

Report No.(s): PB2006-102230; No Copyright; Avail.: CASI: [A04](#), Hardcopy

The USA has supported the objectives of the Montreal Protocol on Substances that Deplete the Ozone Layer (Protocol, or Montreal Protocol) since before the inception of this landmark environmental treaty in 1987. The USA developed this strategy on methyl bromide (MeBr) in accordance with Decision Ex. I/4 (3) which requests a Party nominating a Critical Use Exemption (CUE) after 2005 to provide a national management strategy on the use of MeBr. The information upon which this strategy was developed is the result of a collaborative research effort at the national, state, and local levels.

NTIS

*Bromides; Environment Protection; Management Planning; Methyl Compounds*

**20060002780** Bechtel Nevada Corp., Las Vegas, NV, USA

**National Emission Standards for Hazardous Air Pollutants Calendar Year 2004**

Grossman, R. F.; Jun. 2005; 62 pp.; In English

Report No.(s): DE2005-841797; DOE/NV/11718-1065; No Copyright; Avail.: National Technical Information Service (NTIS)

The sources of radionuclides include current and previous activities conducted on the NTS. The NTS was the primary location for testing of nuclear explosives in the Continental U.S. between 1951 and 1992. Historical testing has included (1) atmospheric testing in the 1950s and early 1960s, (2) underground testing between 1951 and 1992, and (3) open-air nuclear reactor and rocket engine testing (DOE, 1996a). No nuclear tests have been conducted since September 23, 1992 (DOE, 2000), however; radionuclides remaining on the soil surface in many NTS areas after several decades of radioactive decay are re-suspended into the atmosphere at concentrations that can be detected by air sampling. Limited non-nuclear testing includes spills of hazardous materials at the Non-Proliferation Test and Evaluation Complex (formerly called the Hazardous Materials Spill Center), private technology development, aerospace and demilitarization activities, and site remediating activities. Processing of radioactive materials is limited to laboratory analyses; handling, transport, storage, and assembly of nuclear explosive devices or radioactive targets for the Joint Actinide Shock Physics Experimental Research (JASPER) gas gun; and operation of radioactive waste management sites (RWMSs) for low-level radioactive and mixed waste (DOE, 1996a). Monitoring and evaluation of the various activities conducted onsite indicate that the potential sources of offsite radiation exposure in calendar year (CY) 2004 were releases from (1) evaporation of tritiated water (HTO) from containment ponds that receive drainage water from E Tunnel in Area 12 and water pumped from wells used to characterize the aquifers at the sites of past underground nuclear tests, (2) onsite radioanalytical laboratories, (3) the Area 3 and Area 5 RWMS facilities, and (4) diffuse sources of tritium ( $H^{(sup)}3$ ) and re-suspension of plutonium ( $(^{sup}239+^{sup}240)Pu$ ) and americium ( $(^{sup}241)Am$ ) at the

sites of past nuclear tests. The following sections present a general description of the present sources on the NTS and at the North Las Vegas Facility (NLVF). At the NLVF, parts of Building A-1 were contaminated with tritium by a previous contractor in 1995. The incident involved the release of tritium as HTO. This unusual occurrence led to a very small potential exposure to an offsite person. The HTO emission has continued at lower levels (probably re-emanation from building materials), even after cleanup activities in November and December 1997. A description of the incident and the potential effective dose equivalent (EDE) for offsite exposure are set forth in Appendix A.

NTIS

*Air Pollution; Exhaust Emission; Exhaust Gases; Hazardous Materials; Pollution Control; Standards*

**20060002801** Environmental Protection Agency, Washington, DC USA

**Integrated Environmental Strategies Handbook: A Resource Guide for Air Quality Planning**

Dec. 2004; 196 pp.; In English

Report No.(s): PB2006-102239; EPA/430/B-04/006; No Copyright; Avail.: CASI: [A09](#), Hardcopy

As urbanization and industrialization expand globally at a rapid pace, a growing number of developing countries are experiencing a corresponding increase in air pollution and greenhouse gas (GHG) emissions. In recent years, numerous studies have linked certain types of conventional air pollutants with adverse health effects ranging from increased respiratory ailments to premature deaths. Air pollution can also damage crops and forests, disrupt ecosystems, contaminate water bodies, corrode building materials, and reduce visibility. All of these problems can have significant and long-lasting impacts on a country, its people, and its economy. Depending upon their source, emissions of conventional air pollution might be accompanied by GHG emissions. When both types of emissions are generated together (e.g. through fossil fuel combustion), opportunities exist to reduce them simultaneously through integrated measures. Readers should note that there is a clear distinction between GHGs and conventional air pollutants. Conventional air pollutants pose local and regional environmental and health risks, while GHGs are more often seen as a global concern, contributing to climate change. As an element of the USA governments commitment to address climate change, the USA Environmental Protection Agency (U.S. EPA) developed this handbook. The handbook is designed to help readers in developing countries learn about and potentially adopt co-benefits measures to improve local air quality and reduce associated GHGs. This handbook describes the U.S. EPA's Integrated Environmental Strategies (IES) Program approach. The IES approach enables local researchers to quantify the co-benefits that could be derived from implementing policy, technology, and infrastructure measures to reduce air pollutants and GHG emissions. Quantifying the effects of air emissions brings research into the public decision-making process and provides a solid foundation upon which to build environmental and public health improvements.

NTIS

*Air Quality; Developing Nations; Handbooks; Management Planning*

**20060002847** Lehigh Univ., Bethlehem, PA, USA

**Balancing of Pulverized Coal Flows to Burners in Boilers with Pressurized Vertical Spindle Mills. Final Report for the Period October 1, 2003 to March 31, 2005**

Bilirgen, H.; January 2005; 38 pp.; In English

Report No.(s): DE2005-850171; No Copyright; Avail.: National Technical Information Service (NTIS)

Poor coal flow distribution to the burners is a common problem in pulverized coal (pc) boilers and has been considered as a potential area that needs to be addressed for improving unit performance, emissions, operations, and maintenance. With the introduction of new generation ultra low-nitrogen oxide burners, uniform distribution of coal flow to the burners has become an important issue due to restricted secondary air flow during the early stages of combustion. Coal pipe imbalances among the burners results in deviation from the design values for air-to-fuel ratios in the burners. This causes an associated deterioration in combustion efficiency due to increased carbon in fly ash level and leads to increased fuel and ash handling cost and possible deterioration in ESP collection efficiency.

NTIS

*Balancing; Boilers; Burners; Coal; Fuels; Grinding (Comminution); Spindles*

**20060002848** ADA Environmental Solutions, LLC, Littleton, CO, USA

**Field Test Program to Develop Comprehensive Design, Operating, and Cost Data for Mercury Control Systems. Final Technical Report. (Report for October 1, 2000 through March 31, 2005)**

Mar. 28, 2005; 88 pp.; In English

Report No.(s): DE2005-850172; No Copyright; Avail.: National Technical Information Service (NTIS)

With the nation's coal-burning utilities facing the possibility of tighter controls on mercury pollutants, the U.S. Department of Energy is funding projects that could offer power plant operators better ways to reduce these emissions at much lower costs. Mercury is known to have toxic effects on the nervous systems of humans and wildlife. Although it exists only in trace amounts in coal, mercury is released when coal burns and can accumulate on land and in water. In water, bacteria transform the metal into methylmercury, the most hazardous form of the metal. Methylmercury can collect in fish and marine mammals in concentrations hundreds of thousands times higher than the levels in surrounding waters. One of the goals of DOE is to develop technologies by 2005 that will be capable of cutting mercury emissions 50 to 70 percent at well under one-half of projected DOE/EPA early cost estimates. ADA Environmental Solutions (ADA-ES) is managing a project to test mercury control technologies at full scale at four different power plants from 2000 to 2003. The ADA-ES project is focused on those power plants that are not equipped with wet flue gas desulfurization systems. ADA-ES has developed a portable system that was tested at four different utility power plants. Each of the plants is equipped with either electrostatic precipitators or fabric filters to remove solid particles from the plant's flue gas.

NTIS

*Activated Carbon; Bitumens; Boilers; Coal; Data Systems; Design to Cost; Field Tests; Financial Management; Flue Gases; Operating Costs*

**20060002895** Manila Observatory, Philippines

**Integrated Environmental Strategies Philippines Project Report Metropolitan Manila: Focus on the Transport Sector**

Jun. 2005; 122 pp.; In English

Report No.(s): PB2006-102252; No Copyright; Avail.: National Technical Information Service (NTIS)

Realizing that more than 90% of the air pollution comes from mobile sources based on the 2003 emission inventory, the project decided to concentrate primarily on the transportation sector particularly in Metropolitan Manila. Metropolitan Manila, as described before, has more than one-third of all the vehicles in the country. It also has the highest density of population in the country and probably the highest levels of air pollution as well. This project quantified and assessed the public health benefits of different mitigation measures with special focus on transport issues, common to both controlling ambient air pollution and greenhouse gases emissions and made use of health and economic impact as parameters in evaluating the benefits of the mitigation measures.

NTIS

*Air Pollution; Health; Philippines*

**20060002899** Instituto Nacional de Salud Publica, Mexico, National Renewable Energy Lab., Golden, CO USA

**Local Benefits of Global Air Pollution Control in Mexico City**

McKinley, G.; Zuk, M.; Hojer, M.; Avalos, M.; Gonzalez, I.; Aug. 2003; 180 pp.; In English

Report No.(s): PB2006-102253; No Copyright; Avail.: National Technical Information Service (NTIS)

With nearly 20 million inhabitants, 3.5 million vehicles, and 35,000 industries, Mexico City consumes more than 40 million liters of fuel each day. It is also located in a closed basin with a mean altitude of 2240m. The combination of these and other factors has led to a serious air quality problem. In 2002, Mexico City air quality exceeded local standards for ozone (110 ppb for 1 hour) on 80% of the days of the year. Particulate 24- hour standards were exceeded on 5% of the days (SMA, 2002). Greenhouse gas (GHG) emissions from Mexico City are also significant. In 1998, Mexico ranked as the 13th largest GHG producing nation. Mexico City emits approximately 13% of the national total (Sheinbaum et al., 2000). Using a 3.3% annual growth rate (West et al., 2003) and a 1996 base year estimate of 45,585,000 tons of CO<sub>2</sub> (Sheinbaum et al., 2000), we estimate that the annualized GHG emission of Mexico City for the period 2003-2010 and 2003-2020 will be 17 million tons of C equivalent per year and 20 million tons C equivalent per year, respectively. As emissions of GHG and local air pollutants are often generated from the same sources, there may exist opportunities for their joint control. In this study, we have developed a cost-benefit analysis framework to analyze the trade-offs between costs, public health benefits, and GHG emission reductions for a select set of control measures. In an effort to disseminate the knowledge collected in this work, we have also created a reduced-form analysis tool for use by policy makers. This study fits into an ongoing process of analysis and action regarding Mexico City air quality. At present, Mexico City government is currently in the process of implementing its third air quality management plan. The first plan, PICCA (Programa Integral para el Control de la Contaminacion Atmosferica) was initiated in 1990 and had several major accomplishments, including the introduction of two way catalytic converters, the phase out of leaded gasoline, and establishment of vehicle emissions standards. The second program, PROAIRE (Programa para Mejorar la Calidad del Aire en el Valle de Mexico 1995-2000) achieved the introduction of MTBE, restrictions on the aromatic content of fuels and reduction of sulfur content in industrial fuel. While significant improvements in ambient air quality have

improved, levels remain dangerously high, therefore the government has recently initiated the third plan, PROAIRE 2002-2010, as an extension of previous plans.

NTIS

*Air Pollution; Environment Protection; Global Air Pollution; Pollution Control*

**20060002907** Office of Air Quality Planning and Standards, Research Triangle Park, NC USA

**Review of the National Ambient Air Quality Standards for Particulate Matter: Policy Assessment of Scientific and Technical Information, OAQPS Staff Paper**

Dec. 2005; 530 pp.; In English

Report No.(s): PB2006-102406; EPA-452/R-05-005A; No Copyright; Avail.: National Technical Information Service (NTIS)

This Staff Paper, prepared by staff in the U.S. Environmental Protection Agency's (EPA) Office of Air Quality Planning and Standards (OAQPS), evaluates the policy implications of the key studies and scientific information contained in the document, Air Quality Criteria for Particulate Matter (EPA, 2004; henceforth referred to as the Criteria Document (CD) and cited as CD), prepared by EPA's National Center for Environmental Assessment (NCEA). This Staff Paper also presents and interprets results from staff analyses (e.g., air quality analyses, human health risk assessments, and visibility analyses) that staff believes should be considered in EPA's current review of the national ambient air quality standards (NAAQS) for particulate matter (PM). Finally, this Staff Paper presents staff conclusions and recommendations as to potential revisions of the primary (health-based) and secondary (welfare-based) PM NAAQS, based on consideration of the available scientific information and analyses and related limitations and uncertainties.

NTIS

*Air Quality; Ambience; Particulates; Policies*

**20060002944** Environmental Protection Agency, Washington, DC USA, National Renewable Energy Lab., Golden, CO USA

**Ancillary Benefits Due to Greenhouse Gas Mitigation, 2000-2020: Executive Summary**

Joh, S.; Nam, Y.; Shim, S.; Sung, J.; Shin, Y.; Jun. 2001; 26 pp.; In English

Report No.(s): PB2006-102218; No Copyright; Avail.: CASI: [A03](#), Hardcopy

This study is a part of The International Co-Control Analysis Program(ICAP) which is a new initiative sponsored by the US Environmental Protection Agency (EPA) to assist developing countries in evaluating the environmental and human health benefits of technologies and policies for reducing greenhouse gas emissions. The goal of the Korea study is primarily two folds: (1) To assess and quantify the environmental ancillary benefit resulting from greenhouse gas mitigation and (2) To help government officials and stakeholders understand the air pollution benefits of energy technologies that will reduce greenhouse gas emissions, thus the results of this analysis can enhance support for appropriate policy for the United Nations Framework on Climate Change (UNFCCC) and air quality control programs.

NTIS

*Air Pollution; Greenhouse Effect; Pollution Control*

**20060002945** Environmental Protection Agency, Washington, DC USA, National Renewable Energy Lab., Golden, CO USA

**Studies on Health Benefit Estimation of Air Pollution in Korea**

Joh, S.; Mar. 2000; 36 pp.; In English

Report No.(s): PB2006-102219; No Copyright; Avail.: CASI: [A03](#), Hardcopy

In Korea few previous studies on environmental benefit estimates have been carried out. In particular, no studies have dealt with ancillary benefit of green house gas reduction. In this context ancillary benefit study proposed would (1) play a critical role in cost benefit analysis of climate change by giving a reference of benefit estimates such that it will have a significant impact on climate change policy decision and (2) give a good example on environmental benefit estimation in general and calculation of ancillary benefit in a context of climate change in particular. Recent cost benefit study carried out in Kyonggi Province has revealed a mitigation cost of 3,069 million US dollars and benefit of 743 - 2,069 million dollars associated with mortality and morbidity reduced from PM10, SO2, and O3 over 2000-2007. In developed countries PM is generally regarded as most deleterious pollutant. However, in Korea most epidemiologists have consensus that ozone is the most harmful pollutant. Since, ancillary benefit modeling in Korea is in its fledgling stage, suggestion for the model building is timely and useful. Based on Korean situation of data availability, risk potential, and feasibility, the main frame of future Korean study is recommended to investigate in order of priority PM10, SO2, NO2, and ozone as pollutants and Seoul

Metropolitan area, urban area, and nationwide in geographic level to cover.

NTIS

*Air Pollution; Greenhouse Effect; Health; Korea; Pollution Control*

**20060002946** World Resources Inst., Washington, DC, USA

**Climate, Air Pollution and Public Health: Estimating Morbidity and Mortality from Fossil Fuel Consumption in Major Urban Areas in Developing Countries. Final Summary Report**

May 2004; 16 pp.; In English

Contract(s)/Grant(s): EPA-CR-826980-01

Report No.(s): PB2006-102220; No Copyright; Avail.: CASI: [A03](#), Hardcopy

In 1998 the World Resources Institute (WRI) and the US Environmental Protection Agency (EPA) Office of Policy entered into a multi-year Cooperative Agreement CR826980-01: Climate Policy, Air Pollution and Public Health: Estimating Mortality and Morbidity From Fossil Fuel Consumption in Major Urban Areas in Developing Countries. The broad goal of the project was to address the climate change, air pollution and public health implications of energy use in major urban areas, especially the very large 'megacities', of developing countries. The project activity was organized around studies with developing country experts to document the co-benefits that would follow from adopting less carbon-intensive energy and urban transportation policies in order to: (a) lessen the impact of greenhouse gases from fossil fuel combustion, and (b) significantly reduce current and future public health impacts from exposure to combustion-related air pollutants. This involved the development and adaptation of methods, working with technical experts in the target countries, and technical support to these experts in carrying out the assessments. In addition, results of the methods development, case studies and other technical information were synthesized and disseminated to a variety of important audiences including the relevant technical communities (e.g., health researchers, air quality management officials), policy makers, and the interested public. During the roughly four year duration of this project, the cooperative agreement was amended twice and the scope expanded to include assessment of a broader range of ancillary effects (co-benefits or costs) of climate change policies, and development of corporate level green house gas inventory methodology.

NTIS

*Air Pollution; Developing Nations; Public Health; Fuel Consumption; Mortality*

**20060002947** Environmental Protection Agency, Washington, DC USA, National Renewable Energy Lab., Golden, CO USA

**Integrated Assessment of Energy Option and Health Benefit. Full Report**

Changhong, C.; Qingyan, F.; Minghua, C.; Bingheng, C.; Chuanjie, H.; Dec. 2001; 184 pp.; In English

Report No.(s): PB2006-102249; No Copyright; Avail.: National Technical Information Service (NTIS)

This study is one of the components of 'The Integrated Study of Energy Options and Health Benefits in Shanghai' The purpose of this study is to evaluate the reduction of local air pollutant emission and CO2 emission under the assumed energy and environmental policies, and improvement of the pollutant exposure level.

NTIS

*Air Pollution; China; Health*

**20060002948** Environmental Protection Agency, Washington, DC USA, National Renewable Energy Lab., Golden, CO USA

**Ancillary Benefits Due to Greenhouse Gas Mitigation, 2000-2020**

Joh, S.; Nam, Y.; Shim, S.; Sung, J.; Shin, Y.; Jun. 2001; 156 pp.; In English

Report No.(s): PB2006-102250; No Copyright; Avail.: National Technical Information Service (NTIS)

The Korea ICAP work applies a bottom-up impact analysis approach to evaluate the ancillary benefits resulting from greenhouse gas mitigation policies and measures. This work initially has focused on the impact of these greenhouse gas mitigation measures on PM10 levels in the Seoul Metropolitan area and the corresponding impact on premature mortality and morbidity of asthma and respiratory diseases in 1995 through 2020. The greenhouse gas scenarios considered in this preliminary analysis focus primarily on energy efficiency and use of compressed natural gas for vehicles. More aggressive greenhouse gas reduction scenarios that include fuel substitution outside of the transportation sector would likely generate greater air pollution health benefits.

NTIS

*Greenhouse Effect; Health; Korea*

**20060002949** Environmental Protection Agency, Washington, DC USA, Agency for International Development, Washington, DC, USA, National Renewable Energy Lab., Golden, CO USA

**Integrated Environmental Strategies (IES) Study for City of Hyderabad, India**

Apr. 2005; 414 pp.; In English

Report No.(s): PB2006-102251; No Copyright; Avail.: National Technical Information Service (NTIS)

In 2002 the USA Environmental Protection Agency (USEPA) and the USA Agency for International Development (USAID) New Delhi Mission initiated the Integrated Environmental Strategies (IES) program in India to help Indian policy makers identify, evaluate, and eventually implement a variety of mitigation opportunities with local and global cobenefits. The Hyderabad-based project aimed to develop analytical tools and an analytical framework for quantifying greenhouse gas (GHG) and particulate matter (PM10) emissions, and assessing the associated public health benefits from reducing local pollutant concentrations through integrated clean energy strategies. In addition to generating a first-ever emissions inventory of all reported combustion sources in the Hyderabad Urban Development Area (HUDA), the team quantified the emissions reductions from several clean-fuel mitigation scenarios. The IES team also: Prepared a greenhouse gas inventory of all reported fuel combustion sources in HUDA for carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O); Quantified the public health benefits of future mitigation scenarios, as measured by reductions in air pollution-based morbidity and mortality; Estimated the value of those human health benefits; and Compiled a cost/benefit analysis to estimate the financial implications of the different mitigation measures.

NTIS

*Environment Protection; Health; India; Management Planning*

**20060002983** Environmental Protection Agency, Research Triangle Park, NC USA, ARCADIS Geraghty and Miller, Inc., Durham, NC, USA

**Prevention of Elemental Mercury Reemissions from Illinois Coal Wet Scrubbers**

Chang, J. C. S.; Ghorishi, S. B.; Zhao, Y.; Jun. 2005; 40 pp.; In English

Report No.(s): PB2006-102387; EPA-600/R-05/075; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The overall objectives of this study were to perform pilot plant tests to evaluate techniques that can be used to reduce mercury reemissions from wet limestone scrubbers in coal-fired power plants. A pilot-scale (0.01 MW) wet limestone FGD system was designed, constructed, and debugged for the purpose of conducting mercury reemission research. The scrubber used limestone slurry as the reagent to absorb sulfur dioxide and mercury from flue gas generated from a furnace. Usually, natural gas was used as the fuel in the furnace to provide better control of flue gas conditions. An Illinois coal, Galatia, was also burned in the furnace to verify the results from natural gas tests.

NTIS

*Coal; Combustion; Flue Gases; Limestone; Prevention; Scrubbers; Washing*

**47**

**METEOROLOGY AND CLIMATOLOGY**

Includes weather observation forecasting and modification.

**20060002734** Lawrence Livermore National Lab., Livermore, CA USA

**Contribution to: SciDAC Progress Report - Collaborative Design and Development of the Community Climate System Model for Terascale Computing**

Cameron-Smith, P.; Caldeira, K.; Taylor, J.; Lamarque, J. F.; Oct. 18, 2003; 28 pp.; In English

Report No.(s): DE2005-15013759; UCRL-TR-200372; No Copyright; Avail.: National Technical Information Service (NTIS)

Broadly, the goal of this work is to implement interactive ozone photochemistry, methane chemistry, and aerosols into the Community Climate System Model (CCSM) in a way that is computationally efficient yet accurate for climate modeling needs. The original objectives were to implement and validate tropospheric-only chemistry in the CCSM model by the end of 2003, followed by implementation and validation of a combined stratospheretroposphere chemistry capability by the start of 2005, and addition of aerosol microphysics by the end of the project in 2006. This work would leverage the ongoing WACCM effort at NCAR (a combined CGD and ACD effort) and build upon the off-line chemistry models at LLNL (IMPACT model) and NCAR (MOZART model). The goals also include the implementation in CCSM of MAGPI (a marine aerosol and

gas phase interactions code developed by David Erickson at ORNL), and thereby link atmospheric chemistry and sulfate aerosols to ocean biogeochemistry.

NTIS

*Atmospheric Chemistry; Climate Models*

**20060002736** Lawrence Livermore National Lab., Livermore, CA USA

**Three-dimensional Global Model Approaches to Understanding Stratospheric Impacts on Tropospheric Ozone**

Atherton, C.; Bergmann, D.; Cameron-Smith, P.; Connell, P.; Dignon, J.; Jan. 05, 2004; 28 pp.; In English

Report No.(s): DE2005-15013771; UCRL-CONF-201683; No Copyright; Avail.: National Technical Information Service (NTIS)

No abstract available

*Atmospheric Composition; Ozone; Stratosphere; Three Dimensional Models; Troposphere*

**20060002837** California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

**Comparison of Convection Characteristics at the Tropical Western Pacific Darwin Site Between Observation and Global Climate Models Simulations**

Zhang, G. J.; January 2005; 10 pp.; In English

Report No.(s): DE2005-850006; No Copyright; Avail.: National Technical Information Service (NTIS)

One of the scientific objectives of the ARM Tropical Warm Pool International Cloud Experiment (TWP-ICE) planned for early 2006 at Darwin, Australia is to describe convection characteristics and its interaction with the large-scale fields. In view of the short duration of the experiment, it is important to determine the long-term statistics of convection and its associated clouds from the observations and global climate models (GCM) so as to put the experiment results in proper climate perspective. For this purpose, we examine several important fields associated with the characteristics of convection and the relationships between convection and clouds using GCM simulations and available satellite and surface observations. These include the seasonal variation of convection, the relationships between convection and the upper-level cloud amount, cloud ice water content and cloud radiative forcing. One major goal of the ARM program is to improve GCM cloud and convection parameterizations. Using NCAR Community Atmosphere Model (CAM3), we demonstrate that GCM simulations in the tropical western Pacific including Darwin can be significantly improved by improving convection parameterization.

NTIS

*Climate Models; Climatology; Convection; Pacific Ocean; Simulation; Tropical Regions*

**20060002865** Lawrence Livermore National Lab., Livermore, CA USA

**National Atmospheric Release Advisory Center (NARAC) Model Development and Evaluation**

Sugiyama, G.; Apr. 01, 2004; 35 pp.; In English

Report No.(s): DE2005-15014080; UCRL-PROC-203306; No Copyright; Avail.: National Technical Information Service (NTIS)

No abstract available

*Atmospheric Chemistry; Research Facilities*

**20060002869** Lawrence Livermore National Lab., Livermore, CA USA

**Measurements of Net Radiation, Ground Heat Flux and Surface Temperature in an Urban Canyon**

Gouveia, F. J.; Leach, M. J.; Shinn, J. H.; Nov. 2003; 12 pp.; In English

Report No.(s): DE2005-15013666; UCRL-PROC-200847; No Copyright; Avail.: Department of Energy Information Bridge

The Joint Urban 2003 (JU2003) field study was conducted in Oklahoma City in July 2003 to collect data to increase our knowledge of dispersion in urban areas. Air motions in and around urban areas are very complicated due to the influence of urban structures on both mechanical and thermal forcing. During JU2003, meteorological instruments were deployed at various locations throughout the urban area to characterize the processes that influence dispersion. Some of the instruments were deployed to characterize urban phenomena, such as boundary layer development. In addition, particular sites were chosen for more concentrated measurements to investigate physical processes in more detail. One such site was an urban street canyon on Park Avenue between Broadway and Robinson Avenues in downtown Oklahoma City. The urban canyon study was designed to examine the processes that control dispersion within, into and out of the urban canyon. Several towers were deployed in the Park Avenue block, with multiple levels on each tower for observing the wind using sonic anemometers. Infrared thermometers, net radiometers and ground heat flux plates were deployed on two of the towers midway in the canyon

to study the thermodynamic effects and to estimate the surface energy balance. We present results from the surface energy balance observations.

NTIS

*Canyons; Cities; Heat Flux; Radiant Heating; Surface Temperature*

**20060002961** Lawrence Livermore National Lab., Livermore, CA USA

**Advancing Climate and Carbon Simulation**

Thompson, S.; Dec. 15, 2004; 18 pp.; In English

Report No.(s): DE2005-15011598; UCRL-TR-208623; No Copyright; Avail.: National Technical Information Service (NTIS)

We use a recently developed integrated climate/carbon model to perform breakthrough studies of the climate. Two major studies are carried out--namely the effects of CO(sub 2)-fertilized vegetation on global climate and carbon dynamics, and the effect of climate sensitivity on carbon cycle feedback. We have also begun development of a next-generation climate/carbon modeling capability.

NTIS

*Carbon; Climate; Simulation*

**20060002967** Lawrence Livermore National Lab., Livermore, CA USA

**Implementation of the Finite-Volume Dynamical Core in the Community Atmosphere Model**

Sawyer, W. B.; Mirin, A. A.; Dec. 02, 2004; 20 pp.; In English

Report No.(s): DE2005-15011613; UCRL-PROC-208350; No Copyright; Avail.: National Technical Information Service (NTIS)

A distributed memory message-passing parallel implementation of a finite-volume discretization of the primitive equations in the Community Atmosphere Model is presented. These three-dimensional equations can be decoupled into a set of two-dimensional equations by the introduction of a floating vertical coordinate, resulting in considerable potential parallelism. Subsequent analysis of the data dependencies in particular those arising from the polar singularity of the latitude-longitude coordinate system--suggests that two separate domain decompositions should be employed, each tailored for a different part of the model. The implementation requires that data be periodically redistributed between these two decompositions.

NTIS

*Atmospheric Models; Finite Volume Method; Numerical Analysis*

**20060002974** Lawrence Livermore National Lab., Livermore, CA USA

**COAMPS Application to Global and Homeland Security Threat Problems**

Chin, H. N.; Galscoe, L. G.; Sep. 16, 2004; 34 pp.; In English

Report No.(s): DE2005-15011638; UCRL-TR-206584; No Copyright; Avail.: National Technical Information Service (NTIS)

Atmospheric dispersion problems have received more attention with regard to global and homeland security than their conventional roles in air pollution and local hazard assessment in the post 9/11 era. Consequently, there is growing interest to characterize meteorology uncertainty at both low and high altitudes (below and above 30 km, respectively). A 3-D Coupled Ocean Atmosphere Prediction System (COAMPS, developed by Naval Research Laboratory; Hodur, 1997) is used to address LLNL's task. The objective of this report is focused on the effort at the improvement of COAMPS forecast to address the uncertainty issue, and to provide new capability for high-altitude forecast. To assess the atmospheric dispersion behavior in a wider range of meteorological conditions and to expand its vertical scope for the potential threat at high altitudes, several modifications of COAMPS are needed to meet the project goal. These improvements include (1) the long-range forecast capability to show the variability of meteorological conditions at a much larger time scale (say, a year), and (2) the model physics enhancement to provide new capability for high-altitude forecast.

NTIS

*Security; Meteorology*

48  
**OCEANOGRAPHY**

Includes the physical, chemical and biological aspects of oceans and seas; ocean dynamics; and marine resources. For related information see also 43 *Earth Resources and Remote Sensing*.

**20060003773** Laboratoire d'Océanographie de Villefranche, Villefranche-sur-Mer, France

**The LOV Method**

Claustre, Herve; Ras, Josephine; The Second SeaWiFS HPLC Analysis Round-Robin Experiment (SeaHARRE-2); August 2005, pp. 1-3; In English; See also 20060003771; No Copyright; Avail.: CASI: [A01](#), Hardcopy

The LOV method applies a sensitive reversed-phase HPLC technique for the determination of chloropigments and carotenoids within approximately 24 min. The different pigments are detected by a DAD which allows for automatic identification to be carried out on the basis of absorption spectra. Optical densities are monitored at 440nm (chloropigments and carotenoids) and at 667nm (chloropigments only). The method provides a good resolution between chlorophyll a and divinyl chlorophyll a, but uncertainties may arise for the partial separation of chlorophyll b and divinyl chlorophyll b, and for the resolution of chlorophyll c pigments. The problem of coelution between 19'-hexanoyloxyfucoxanthin and prasinoxanthin may also be an issue in coastal Case-2 waters where the latter can be present in more significant concentrations. Effective limits of quantitation for most pigments are low ( $0.0005 \text{ mg m}^{-3}$  for chlorophyll a and  $0.0008 \text{ mg m}^{-3}$  for carotenoids).

Author

*Absorption Spectra; Carotenoids; Chlorophylls; Pigments*

**20060003774** Plymouth Marine Lab., UK

**The PML Method**

Fishwick, James; Llewellyn, Carole; Aiken, James; The Second SeaWiFS HPLC Analysis Round-Robin Experiment (SeaHARRE-2); August 2005, pp. 1-3; In English; See also 20060003771; No Copyright; Avail.: CASI: [A01](#), Hardcopy

The PML method successfully resolves and quantifies over 20 chlorophyll and carotenoid pigments from a variety of water types, ranging from estuaries to oligotrophic oceans. A C8 column is used in combination with a methanol-based binary solvent system following a linear gradient. The method separates monovinyl and divinyl chlorophylls a and b, and the carotenoids lutein and zeaxanthin. A DAD is configured at 440nm to determine chlorophylls and carotenoids and at 667nm for the determination of chlorophyllide a and phaeopigments. The method provides good resolution with a run time of approximately 30 min excluding an additional 15 min to restore the column and solvent gradient prior to the next injection. The internal standard, trans-Beta-apo-8'-carotenal, improves the accuracy of the analysis.

Author

*Carotenoids; Chlorophylls; Oceanography*

**20060003777** Maryland Univ., Cambridge, MD, USA

**The HPL Method**

Van Heukelem, Laurie; Thomas, Crystal S.; The Second SeaWiFS HPLC Analysis Round-Robin Experiment (SeaHARRE-2); August 2005, pp. 1-7; In English; See also 20060003771; No Copyright; Avail.: CASI: [A02](#), Hardcopy

The HPL method was developed for use with a variety of water types. Many pigments important to freshwater, estuarine, and oceanic systems are baseline resolved and quantitatively reported, including divinyl and monovinyl chlorophyll a. The linear dynamic range for chlorophyll a extends approximately from 0.3 to 700 ng per injection. The method is based on a C8 HPLC column, a methanol-based reversed-phase gradient solvent system, a simple linear gradient, and an elevated column temperature (60°C). The method can provide quantitative results for up to 25 pigments with qualitative information for additional pigments. Quality assurance measurements are made during sample analysis to confirm method performance is within expectations. Investigations into the uncertainties in the method show the 95% confidence limits were estimated as a) 0.5-3.8% for precision of replicate injections within and across sequences, b) 3.2% for chlorophyll a calibration reproducibility, and c) 5.1% for chlorophyll a method precision, including filter extraction and analysis.

Author

*Liquid Chromatography; Oceanography*

**20060003778** Marine and Coastal Management, Cape Town, South Africa

**The MCM Method**

Barlow, Ray; Sessions, Heather; The Second SeaWiFS HPLC Analysis Round-Robin Experiment (SeaHARRE-2); August 2005, pp. 1-3; In English; See also 20060003771; No Copyright; Avail.: CASI: [A01](#), Hardcopy

The MCM method is a reversed-phase HPLC technique using a binary solvent system following a step linear gradient on a C8 chromatography column. Baseline separation of monovinyl and divinyl chlorophyll a and of lutein and zeaxanthin, partial separation of monovinyl and divinyl chlorophyll b, and resolution of other key chlorophylls and carotenoids are achieved in an analysis time of approximately 30 min. The use of trans- $\beta$ -apo8'-carotenal as an internal standard improves the accuracy of pigment determinations. Providing a pragmatic balance between good analyte resolution and acceptable sample throughput, the method is suitable for the analysis of a wide range of oceanographic seawater samples.

Author

*Liquid Chromatography; Oceanography*

**20060003779** San Diego State Univ., San Diego, CA, USA

#### **The SDSU (CHORS) Method**

Perl, Jason; Trees, Charles; The Second SeaWiFS HPLC Analysis Round-Robin Experiment (SeaHARRE-2); August 2005, pp. 1-3; In English; See also 20060003771; No Copyright; Avail.: CASI: [A01](#), Hardcopy

The CHORS method was developed to provide HPLC phytoplankton pigment analyses for the NASA SIMBIOS program, following the protocols presented in the Ocean Optics Protocols for Satellite Ocean Color Sensor Validation (Bidigare et al. 2002). The method (Wright et al. 1991) was designed to support a wide range of pigment concentrations from waters sampled throughout the world ocean, but does not chromatographically separate the divinyl chlorophylls a and b from their corresponding monovinyl forms. The Latasa et al. (1996) dichromatic equations were used to spectrally resolve divinyl chlorophyll a from monovinyl chlorophyll a. The method uses a reversed-phase C18 column, with a tertiary solvent gradient. In addition, a temperature-controlled autosampler provides continuous sample injection to maintain a quota of analyzing 4,000 samples per year. System calibration is routinely monitored and recorded each month to ensure repeatability and consistency of data products.

Author

*Liquid Chromatography; Chromatography; Oceanography*

## **51**

### **LIFE SCIENCES (GENERAL)**

Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance of animals and plants in space and related environmental conditions. For specific topics in life sciences see *categories 52 through 55*.

**20060003772** Biological Sciences, Dartmouth, Canada

#### **The BIO Method**

Stuart, Venetia; Head, Erica; The Second SeaWiFS HPLC Analysis Round-Robin Experiment (SeaHARRE-2); August 2005, pp. 1-3; In English; See also 20060003771; No Copyright; Avail.: CASI: [A01](#), Hardcopy

The BIO HPLC method is similar to the method described by Gieskes and Kraay (1989), using a C18 HPLC column in combination with a methanol-based, reversed-phase binary gradient system. This method effectively separates the major key pigments in an analysis time of 30 min, but does not permit the separation of mono and divinyl chlorophylls a and b. Separation of the divinyl pigments can, however, be achieved by acidifying a second sample, and quantifying the divinyl phaeophytin-like pigments. Acidification of samples with dilute HCL effectively separates divinyl phaeophytin a and b from phaeophytin a and b, respectively. Application of the latter procedure to chromatographically separate the divinyl forms requires each sample to be analyzed twice.

Author

*Chlorophylls; Gradients; Hydrochloric Acid; Pigments*

## AEROSPACE MEDICINE

Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral effects of aerospace environments, see *53 Behavioral Sciences*. For the effects of space on animals and plants see *51 Life Sciences*.

**20060002977** Lawrence Livermore National Lab., Livermore, CA USA

**Modern Chemistry Techniques Applied to Metal Behavior and Chelation in Medical and Environment Systems. Final Report**

Sutton, M.; Andresen, B.; Burastero, S. R.; Chiarappa-Zucca, M. L.; Feb. 14, 2005; 112 pp.; In English  
Report No.(s): DE2005-15015925; UCRL-TR-209476; No Copyright; Avail.: National Technical Information Service (NTIS)

This report details the research and findings generated over the course of a 3-year research project funded by Lawrence Livermore National Laboratory (LLNL) Laboratory Directed Research and Development (LDRD). Originally tasked with studying beryllium chemistry and chelation for the treatment of Chronic Beryllium Disease and environmental remediation of beryllium-contaminated environments, this work has yielded results in beryllium and uranium solubility and speciation associated with toxicology; specific and effective chelation agents for beryllium, capable of lowering beryllium tissue burden and increasing urinary excretion in mice, and dissolution of beryllium contamination at LLNL Site 300; (sup 9)Be NMR studies previously unstudied at LLNL; secondary ionization mass spec (SIMS) imaging of beryllium in spleen and lung tissue; beryllium interactions with aerogel/GAC material for environmental cleanup. The results show that chelator development using modern chemical techniques such as chemical thermodynamic modeling, was successful in identifying and utilizing tried and tested beryllium chelators for use in medical and environmental scenarios.

NTIS

*Beryllium; Chelation; Chemical Analysis; Body Fluids; Dissolving; Excretion; Interstitials*

**20060003204** Pittsburgh Univ., Pittsburgh, PA, USA

**A New Approach for Reconstruction of the Left Ventricle from Biplane Angiocardigrams**

Bai, Z. D.; Krishnaiah, P. R.; Rao, C. R.; Reddy, P. S.; Sun, Y. N.; Zhao, L. C.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 1225-1228; In English; See also 20060003045; Copyright; Avail.: Other Sources

A new method for reconstruction of the left ventricle from the biplane angiocardigrams is proposed. By dividing the two projection images into parallel slices, the ventricular reconstruction is processed slice by slice stepwise. Each corresponding pair of slices form two one-dimensional projection profiles used to reconstruct a ventricular cross section. Without using predefined binary mask models, we propose to reconstruct the cross section under the assumption that the cross section is regular and a monotonically non-decreasing or non-increasing equal-divisor curve is available. Instead of solving the binary matrix directly, we need only to obtain the equal-divisor curve. Then the cross section is uniquely determined. The experiments show better results than by any existing direct methods. It also prevents the sensitive selection of mask models.

Author

*Cardiograms; Imaging Techniques*

## MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

Includes general topics and overviews related to mathematics and computer science. For specific topics in these areas see *categories 60 through 67*.

**20060002730** California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

**Roles of Sparse Direct Methods in Large-Scale Simulations**

Li, X. S.; Gao, W.; Husbands, P. J. R.; Yang, C.; Ng, E. H.; January 2005; 10 pp.; In English  
Report No.(s): DE2005-843015; No Copyright; Avail.: National Technical Information Service (NTIS)

Sparse systems of linear equations and eigen-equations arise at the heart of many large-scale, vital simulations in DOE. Examples include the Accelerator Science and Technology SciDAC (Omega3P code, electromagnetic problem), the Center for Extended Magnetohydrodynamic Modeling SciDAC(NIMROD and M3D-C1 codes, fusion plasma simulation). The Terascale Optimal PDE Simulations (TOPS) is providing high-performance sparse direct solvers, which have had significant impacts on these applications. Over the past several years, we have been working closely with the other SciDAC teams to solve their large,

sparse matrix problems arising from discretization of the partial differential equations. Most of these systems are very ill-conditioned, resulting in extremely poor convergence deployed our direct methods techniques in these applications, which achieved significant scientific results as well as performance gains. These successes were made possible through the SciDAC model of computer scientists and application scientists working together to take full advantage of terascale computing systems and new algorithms research.

NTIS

*Simulation; Linear Equations; Computer Techniques; Magnetohydrodynamics*

**20060002747** Lawrence Livermore National Lab., Livermore, CA USA

**Progressive Compression of Volumetric Subdivision Meshes**

Leney, D.; Pascucci, V.; Apr. 21, 2004; 14 pp.; In English

Report No.(s): DE2005-15014121; UCRL-CONF-203679; No Copyright; Avail.: National Technical Information Service (NTIS)

We present a progressive compression technique for volumetric subdivision meshes based on the slow growing refinement algorithm. The system is comprised of a wavelet transform followed by a progressive encoding of the resulting wavelet coefficients. We compare the efficiency of two wavelet transforms. The first transform is based on the smoothing rules used in the slow growing subdivision technique. The second transform is a generalization of lifted linear B-spline wavelets to the same multi-tier refinement structure. Direct coupling with a hierarchical coder produces progressive bit streams. Rate distortion metrics are evaluated for both wavelet transforms. We tested the practical performance of the scheme on synthetic data as well as data from laser indirect-drive fusion simulations with multiple fields per vertex. Both wavelet transforms result in high quality trade off curves and produce qualitatively good coarse representations.

NTIS

*Algorithms; Smoothing; Grid Refinement (Mathematics)*

**20060002753** Brown Univ., Providence, RI, USA

**Fundamental Investigation of Fuel Transformations in Pulverized Coal Combustion and Gasification Technologies. (Final Report, September 1, 2000-August 31, 2004)**

Hurt, R.; Calo, J.; Fletcher, T. H.; Sayre, A.; Apr. 29, 2005; 238 pp.; In English

Report No.(s): DE2005-842439; No Copyright; Avail.: National Technical Information Service (NTIS)

The goal of this project was to carry out the necessary experiments and analyses to extend current capabilities for modeling fuel transformations to the new conditions anticipated in next-generation coal-based, fuel-flexible combustion and gasification processes. This multi-organization, multi-investigator project has produced data, correlations, and submodels that extend present capabilities in pressure, temperature, and fuel type. The combined experimental and theoretical/computational results are documented in detail in Chapters 1-8 of this report, with Chapter 9 serving as a brief summary of the main conclusions. Chapters 1-3 deal with the effect of elevated pressure on devolatilization, char formation, and char properties. Chapters 4 and 5 deal with advanced combustion kinetic models needed to cover the extended ranges of pressure and temperature expected in next-generation furnaces. Chapter 6 deals with the extension of kinetic data to a variety of alternative solid fuels. Chapter 7 focuses on the kinetics of gasification (rather than combustion) at elevated pressure. Finally, Chapter 8 describes the integration, testing, and use of new fuel transformation submodels into a comprehensive CFD framework. Overall, the effects of elevated pressure, temperature, heating rate, and alternative fuel use are all complex and much more work could be further undertaken in this area. Nevertheless, the current project with its new data, correlations, and computer models provides a much improved basis for model-based design of next generation systems operating under these new conditions.

NTIS

*Coal; Coal Gasification; Combustion; Grinding (Comminution)*

**20060002781** Office of Management and Budget, Washington, DC USA

**Federal Enterprise Architecture Program EA Assessment Framework 2.0**

Dec. 2005; 44 pp.; In English

Report No.(s): PB2006-102232; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Version 2.0 of the Office of Management and Budget (OMB) Enterprise Architecture Assessment Framework is designed to advance the use of enterprise architecture (EA) across the Federal government. This document will serve as the basis for enterprise architecture maturity assessments of federal agencies performed by OMB. This document is a successor to version

1.5 of the OMB EA Assessment Framework. The OMB Enterprise Architecture Assessment Framework helps OMB and the agencies assess the capability of EA programs to guide and inform IT investments support of agency strategic objectives. It also helps to better understand the current state of an agency's EA and assist agencies in integrating their EA into their decision-making processes. By applying the assessment themselves, agencies can identify strengths and weaknesses within their EA programs and adjust them accordingly. As a result, the agency's enterprise architecture will help improve the performance of information resource management (IRM) and information technology (IT) investment decisionmaking.

NTIS

*Architecture (Computers); Assessments; Information Systems*

**20060002782** Federal CIO Council, Washington, DC, USA

**Framework for Developing Earned Value Management Systems (EVMS) Policy for Information Technology (IT) Projects**

Dec. 05, 2005; 22 pp.; In English

Report No.(s): PB2006-102233; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Earned Value Management (EVM) is a project management control tool allowing visibility into technical, cost and schedule planning, performance and progress for major IT projects. EVM not only encourages contractors to use effective internal cost and schedule management control systems, but also provides the manager with timely and consistent cost, schedule and progress data. The implementation of an Earned Value Management System (EVMS) ensures that cost, schedule, and technical aspects of the contract are truly integrated and estimated, and actual progress of the project can be identified. OMB requires the use of an EVMS compliant with the guidelines in ANSI/EIA Standard 748 for all major IT investments with development work. The purpose of this document is to demonstrate a model EVMS framework for the development of agency EVM policy. It is not intended to be all-inclusive, but rather to provide key components as determined through review of existing EVM policies, to assist agencies in developing their EVM policies as required by OMB Memorandum M-05-23. Per OMB Memorandum M-05-23, agencies are to develop such policies no later than December 31, 2005. The intended audience for this document is agency staff responsible for development of agency EVM policy.

NTIS

*Information Systems; Management Systems; Policies; Project Management*

**20060002855** Lawrence Livermore National Lab., Livermore, CA USA

**Automated Image Data Exploitation Final Report**

Futterman, J. A. H.; Kamth, C.; Poland, D.; Sengupta, S. K.; Feb. 17, 2004; 18 pp.; In English

Report No.(s): DE2005-15013923; UCRL-TR-202103; No Copyright; Avail.: National Technical Information Service (NTIS)

The automated production of maps of human settlement from recent satellite images is essential to detailed studies of urbanization, population movement, and the like. Commercial satellite imagery is becoming available with sufficient spectral and spatial resolution to apply computer vision techniques previously considered only for laboratory (high resolution, low noise) images. In this project, we extracted the boundaries of human settlements from IKONOS 4-band and panchromatic images using spectral segmentation together with a form of generalized second-order statistics and detection of edges and corners.

NTIS

*Exploitation; Image Processing; Satellite Imagery*

**20060002858** Lawrence Livermore National Lab., Livermore, CA USA

**Feature Subset Selection, Class Separability, and Genetic Algorithms**

Cantu'-Paz, E.; Jan. 27, 2004; 18 pp.; In English

Report No.(s): DE2005-15013963; UCRL-CONF-202041; No Copyright; Avail.: National Technical Information Service (NTIS)

The performance of classification algorithms in machine learning is affected by the features used to describe the labeled examples presented to the inducers. Therefore, the problem of feature subset selection has received considerable attention. Genetic approaches to this problem usually follow the wrapper approach: treat the inducer as a black box that is used to evaluate candidate feature subsets. The evaluations might take a considerable time and the traditional approach might be unpractical for large data sets. This paper describes a hybrid of a simple genetic algorithm and a method based on class separability applied to the selection of feature subsets for classification problems. The proposed hybrid was compared against each of its components and two other feature selection wrappers that are used widely. The objective of this paper is to

determine if the proposed hybrid presents advantages over the other methods in terms of accuracy or speed in this problem. The experiments used a Naive Bayes classifier and public-domain and artificial data sets. The experiments suggest that the hybrid usually finds compact feature subsets that give the most accurate results, while beating the execution time of the other wrappers.

NTIS

*Algorithms; Data Mining; Genetic Algorithms*

**20060002897** Newcastle-upon-Tyne Univ., Newcastle, UK

**Investigating a Possible Flaw in a Masquerade Detection System**

Killhourhy, K. S.; Maxon, R. A.; Nov. 2004; 16 pp.; In English

Report No.(s): PB2006-102380; CS-TR-869; Copyright; Avail.: National Technical Information Service (NTIS)

Masquerade detection undertakes to determine whether or not one computer user has impersonated another, typically by detecting significant anomalies in the victim's normal behavior, as represented by a user profile formed from system audit data, command histories, and other information characteristic of individual users. Among the many intrusion/masquerade-detection algorithms in use today is the naive Bayes classifier, which has been observed to perform imperfectly from time to time, as will any detector. This paper investigates the prospect of a naive Bayes flaw that foils the detection of attacks conducted by so-called 'super-masqueraders' whose incursions are consistently undetected across an entire range of victims. It is shown, through a rigorous mathematical exposition and an empirical analysis involving over 13,000 experiments, that the detector harbors a weakness (that could be exploited by an attacker) causing it to err under certain conditions. The paper explores and describes those conditions, and suggests how they can be overcome by fortifying the algorithm with a diverse detection capability.

NTIS

*Detection; Nondestructive Tests*

**20060002964** Lawrence Livermore National Lab., Livermore, CA USA

**Multiresolution Techniques for Interactive Texture-Based Rendering of Arbitrarily Oriented Cutting Planes**

laMar, E.; Duchaineau, M. A.; Hamann, B.; Joy, K. I.; Oct. 03, 2001; 16 pp.; In English

Report No.(s): DE2005-15013472; UCRL-JC-145746; No Copyright; Avail.: National Technical Information Service (NTIS)

We present a multiresolution technique for interactive texture based rendering of arbitrarily oriented cutting planes for very large data sets. This method uses an adaptive scheme that renders the data along a cutting plane at different resolutions: higher resolution near the point-of-interest and lower resolution away from the point-of-interest. The algorithm is based on the segmentation of texture space into an oak-tree, where the leaves of the tree define the original data and the internal nodes define lower resolution versions.

NTIS

*Computers; Cutting; Image Resolution*

**20060002981** Environmental Protection Agency, Las Vegas, NV, USA, Norwich Univ., Northfield, VT, USA, Dartmouth Medical School, Hanover, NH, USA

**BioSim2 User's Manual, Version 2.0.03: A Program that Applies the Coefficient of Biotic Similarity, B, to Complex Data Matrices**

Pearson, J. G.; Pinkham, C. F. A.; Reid, B. P.; Chevalier, V. T.; Nov. 2005; 48 pp.; In English

Report No.(s): PB2006-102385; EPA/600/R-05/150; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The Pinkham-Pearson index of similarity has been evaluated by EPA as one of the more powerful tools for comparing community structure in its rapid bioassessment protocol. However, its use has been limited because the program that ran it, BioSim1, was only available in DOS format. A user-friendly version of BioSim2 is now available in a Java format that can run on Windows, Mac OS, Linux, or any computer operating system that supports Java v1.4 or higher.

NTIS

*Analogies; Coefficients; Computer Programs; Matrices (Mathematics); User Manuals (Computer Programs)*

**20060003017** Lawrence Livermore National Lab., Livermore, CA USA

**Daktools**

Tipton, P.; Brandon, S.; Aug. 09, 2004; 16 pp.; In English

Report No.(s): DE2005-15014705; UCRL-CONF-205847; No Copyright; Avail.: National Technical Information Service (NTIS)

This program provides tools that fit into the DAKOTA workflow to make runs more powerful and easy; provides code independence; provides machine independence; maximizes user's efficiency at studying code behavior; and allows easy structure for users to use and make tools to analyze data. It is implemented in PYTHON for programmability and ease of use.

NTIS

*Computer Programs; Data Processing*

**20060003025** Lawrence Livermore National Lab., Livermore, CA USA

**Natural Language Processing as a Discipline at LLNL**

Firpo, M. A.; Feb. 18, 2005; 38 pp.; In English

Report No.(s): DE2005-15015192; UCRL-TR-209871; No Copyright; Avail.: Department of Energy Information Bridge

The field of Natural Language Processing (NLP) is described as it applies to the needs of Lawrence Livermore National Laboratory (LLNL) in handling free-text. The state of the practice is outlined with the emphasis placed on two specific aspects of NLP: Information Extraction and Discourse Integration. A brief description is included of the NLP applications currently being used at LLNL. A gap analysis provides a look at where the technology needs work in order to meet the needs of LLNL. Finally, recommendations are made to meet these needs.

NTIS

*Data Processing; Natural Language (Computers); Natural Language Processing; Texts*

**20060003026** Lawrence Livermore National Lab., Livermore, CA USA

**Liner Builder: A Tool for Building Geometric Models of Shaped Charge Liners**

Henshaw, W. D.; Jan. 12, 2005; 36 pp.; In English

Report No.(s): DE2005-15014503; UCRL-SM-208948; No Copyright; Avail.: National Technical Information Service (NTIS)

This document describes the Liner Builder, an interactive graphics tool for building a geometric model of the conical liner that fits in the hollow cavity on the end of a shaped charge. This tool can also be used to load the volume of the liner with a distribution of spherical particles.

NTIS

*Computer Graphics; Linings; Shaped Charges*

**20060003031** Commissariat à l'Energie Atomique, Bruyeres-le-Chatel, France, Lawrence Livermore National Lab., Livermore, CA, USA

**Knowledge Representation Issues in Semantic Graphs for Relationship Detection**

Barthelemy, M.; Chow, E.; Eliassi-Rad, T.; Feb. 18, 2005; 14 pp.; In English

Report No.(s): DE2005-15015947; UCRL-CONF-209845; No Copyright; Avail.: Department of Energy Information Bridge

An important task for Homeland Security is the prediction of threat vulnerabilities, such as through the detection of relationships between seemingly disjoint entities. A structure used for this task is a 'semantic graph', also known as a 'relational data graph' or an 'attributed relational graph'. These graphs encode relationships as typed links between a pair of typed nodes. Indeed, semantic graphs are very similar to semantic networks used in AI. The node and link types are related through an ontology graph (also known as a schema). Furthermore, each node has a set of attributes associated with it (e.g., 'age' may be an attribute of a node of type 'person'). Unfortunately, the selection of types and attributes for both nodes and links depends on human expertise and is somewhat subjective and even arbitrary. This subjectiveness introduces biases into any algorithm that operates on semantic graphs. Here, we raise some knowledge representation issues for semantic graphs and provide some possible solutions using recently developed ideas in the field of complex networks. In particular, we use the concept of transitivity to evaluate the relevance of individual links in the semantic graph for detecting relationships.

NTIS

*Knowledge Representation; Semantics*

**20060003032** Lawrence Livermore National Lab., Livermore, CA USA

**Phase Sensitive Cueing for 3D Objects in Overhead Images**

Paglieroni, D. W.; Mar. 10, 2005; 50 pp.; In English

Report No.(s): DE2005-15016031; UCRL-TR-210372; No Copyright; Avail.: National Technical Information Service (NTIS)

Locating specific 3D objects in overhead images is an important problem in many remote sensing applications. 3D objects may contain either one connected component or multiple disconnected components. Solutions must accommodate images acquired with diverse sensors at various times of the day, in various seasons of the year, or under various weather conditions. Moreover, the physical manifestation of a 3D object with fixed physical dimensions in an overhead image is highly dependent on object physical dimensions, object position/orientation, image spatial resolution, and imaging geometry (e.g., obliqueness). This paper describes a two-stage computer-assisted approach for locating 3D objects in overhead images. In the matching stage, the computer matches models of 3D objects to overhead images. The strongest degree of match over all object orientations is computed at each pixel. Unambiguous local maxima in the degree of match as a function of pixel location are then found. In the cueing stage, the computer sorts image thumbnails in descending order of figure-of-merit and presents them to human analysts for visual inspection and interpretation.

NTIS

*Computers; Cues; Sensitivity*

**20060003033** Lawrence Livermore National Lab., Livermore, CA USA

### **Salient Points for Tracking Moving Objects in Video**

Kamath, C.; Gezahegne, A.; Newsam, S.; Roberts, G. M.; Dec. 21, 2004; 18 pp.; In English

Report No.(s): DE2005-15011517; UCRL-CONF-208738; No Copyright; Avail.: Department of Energy Information Bridge

Detection and tracking of moving objects is important in the analysis of video data. One approach is to maintain a background model of the scene and subtract it from each frame to detect the moving objects which can then be tracked using Kalman or particle filters. In this paper, we consider simple techniques based on salient points to identify moving objects which are tracked using motion correspondence. We focus on video with a large field of view, such as a traffic intersection with several buildings nearby. Such scenes can contain several salient points, not all of which move between frames. Using public domain video and two types of salient points, we consider how to make these techniques computationally efficient for detection and tracking. Our early results indicate that salient regions obtained using the Lowe keypoints algorithm and the Scale-Saliency algorithm can be used successfully to track vehicles in moderate resolution video.

NTIS

*Targets; Video Data*

## **60**

### **COMPUTER OPERATIONS AND HARDWARE**

Includes hardware for computer graphics, firmware and data processing. For components see 33 *Electronics and Electrical Engineering*. For computer vision see 63 *Cybernetics, Artificial Intelligence and Robotics*.

**20060003140** University of Central Florida, Orlando, FL, USA

### **Implementation of Kalman Filters Using Systolic Arrays**

Papadourakis, George M.; Taylor, Fred J.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 19.6.1 - 19.6.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

The implementation of the Kalman filter using systolic architectures is considered. Using an orthogonal array processor, a new algorithm is presented which increases the throughput of matrix operations with no additional hardware. The new algorithm makes use of high level pipelining so loading process and arithmetic operations can be performed simultaneously yielding higher PE utilization and faster performance.

Author

*Kalman Filters; Systolic Arrays; Architecture (Computers)*

**20060003177** National Taiwan Univ., Taipei, Taiwan, Province of China

### **A Multiple Microprocessor System for General DSP Operations**

Yang, Gregory Y.; Lien, Brian K.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 1047-1050; In English; See also 20060003045; Copyright; Avail.: Other Sources

A multiple microcomputer system for digital signal and image processing applications is presented. A simple ring structure is employed to organize the multiple microcomputers. The data flow in the ring structure is unidirectional. A task can be partitioned and be distributed among the microcomputers. Pipelined execution of a task is thus possible. Implementation with the use of the TMS32010 signal processing CPU and IBM PC is demonstrated. A design to ensure the program

synchronization is also shown. A algorithm for carrying out IIR filtering is developed. Experimental results are presented.  
Author

*Microprocessors; Synchronism; Signal Processing; Image Processing*

**20060003196** Texas Instruments, Inc., Dallas, TX, USA

**Connected Word Recognizer on a Multiprocessor System**

Pawate, B. I.; McMahan, M. L.; Wiggins, R. H.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 27.8.1 - 27.8.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

Speech recognition algorithms employing a similarity measure between the input speech utterance and the stored reference patterns to determine recognition of a word/sentence are computationally intensive. The instantaneous vocabulary size that can be handled in real-time is relatively small. This limitation can be alleviated by either using multiple programmable processors or by using special purpose hardware to handle the computation-intensive tasks. In a research environment the former approach is preferred, because improvements to the algorithm can rapidly be incorporated and their effects studied in real-time. Texas Instruments have developed a multiple-processor architecture based on the TMS32020 DSP, called Odyssey, the interfaces with Explorer, a symbolic computer. This paper addresses the issues involved in partitioning and allocating tasks in a multiple-processor environment to maximize throughput, and discusses the implementation of a grammar-driven speaker-dependent connected-word recognizer (GDCWR) as an example application that uses the power of multiple processors.

Author

*Analogies; Multiprocessing (Computers); Words (Language)*

**20060003636** Fondazione Ugo Bordoni, Rome, Italy

**Multiport Modulo-2 Generators Of Pseudorandom Binary Sequences**

Brugia, O.; Wolfomwicz, W.; Pioli, M.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 852-855; In English; See also 20060003631; Copyright; Avail.: Other Sources

The paper deals with the problem of generating pseudorandom binary sequences at high digit rates by multiport modulo-2 sequential networks working at suitably reduced rates, and gives a method of synthesis of these networks particularly oriented to the cases in which the required reduction factor (and, hence, the number of output ports) is an integral power of 2.

Author

*Binary Digits; Pseudorandom Sequences; Multiprocessing (Computers)*

**20060003740** Indian Inst. of Tech., Madras, India

**Similarity Of Graphs And Enumeration Of Dissimilar n-th Order Symmetric Sign Patterns**

Naidu, M. G. G.; Reddy, P. S.; Thulasiraman, K.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 981-984; In English; See also 20060003631; Copyright; Avail.: Other Sources

The concepts of similarity of n-th order symmetric sign patterns and similarity of n-vertex labelled directed graphs are introduced. Two sign patterns are similar if and only if their corresponding directed graphs are similar. The main contributions of the paper are a formula to count the maximum number of mutually dissimilar directed graphs (symmetric sign patterns) and two algorithms - one to generate a set of mutually dissimilar directed graphs (symmetric sign patterns) and the other to test the similarity of two directed graphs (symmetric sign patterns).

Author

*Graphs (Charts); Graph Theory; Enumeration*

**61**

**COMPUTER PROGRAMMING AND SOFTWARE**

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

**20060002953** Deutsches Elektronen-Synchrotron, Hamburg, Germany

**Wan Emulation Development and Testing at Fermilab**

Bobyshv, A.; Rechemacker, R.; Demar, P.; January 2005; 8 pp.; In English

Report No.(s): DE2005-15016954; FERMILAB-CONF-04-464; No Copyright; Avail.: National Technical Information Service (NTIS)

The Compact Muon Solenoid (CMS) experiment at CERN's Large Hadron Collider (LHC) is scheduled to come on-line in 2007. Fermilab will act as the CMS Tier-1 centre for the US and make experiment data available to more than 400 researchers in the US participating in the CMS experiment. The US CMS Users Facility group, based at Fermilab, has initiated a project to develop a model for optimizing movement of CMS experiment data between CERN and the various tiers of US CMS data centres and to design a WAN emulation facility which will enable controlled testing of unmodified or modified CMS applications and TCP implementations locally under conditions that emulate WAN connectivity. The WAN emulator facility is configurable for latency, jitter, and packet loss. The initial implementation is based on the NISTnet software product. In this paper we will describe the status of this project to date, the results of validation and comparison of performance measurements obtained in emulated and real environment for different applications including multi streams GridFTP.

NTIS

*Wide Area Networks; Computer Programs*

**20060002955** Fermi National Accelerator Lab., Batavia, IL, USA, Glasgow Univ., UK, Karlsruhe Univ., Germany, Rutgers - The State Univ., Piscataway, NJ, USA

**Samgrid Monitoring Service and its Integration with Monalisa**

Lyon, A.; Vokac, P.; Zimmerler, M.; January 2005; 8 pp.; In English

Report No.(s): DE2005-15016957; FERMILAB-CONF-04-479; No Copyright; Avail.: National Technical Information Service (NTIS)

The SAMGrid team is in the process of implementing a monitoring and information service, which fulfills several important roles in the operation of the SAMGrid system, and will replace the first generation of monitoring tools in the current deployments. The first generation tools are in general based on text log-files and represent solutions which are not scalable or maintainable. The roles of the monitoring and information service are: (1) providing diagnostics for troubleshooting the operation of SAMGrid services; (2) providing support for monitoring at the level of user jobs; (3) providing runtime support for local configuration and other information which currently must be stored centrally (thus moving the system toward greater autonomy for the SAMGrid station services, which include cache management and job management services); and (4) providing intelligent collection of statistics in order to enable performance monitoring and tuning. The architecture of this service is quite flexible, permitting input from any instrumented SAMGrid application or service. It will allow multiple backend storage for archiving of (possibly) filtered monitoring events, as well as real time information displays and active notification service for alarm conditions.

NTIS

*Architecture (Computers); Data Base Management Systems*

**20060002958** Lawrence Livermore National Lab., Livermore, CA USA

**Shielding Calculations for the BDMS UF(sub 6) Flowmeter**

Radev, R. P.; Hall, J. M.; Sep. 13, 2001; 64 pp.; In English

Report No.(s): DE2005-15013412; UCRL-ID-145377; No Copyright; Avail.: Department of Energy Information Bridge

No abstract available

*Dosage; Flowmeters; Monte Carlo Method*

**20060003047** Massachusetts Inst. of Tech., Lexington, MA, USA

**A Speaker-Stress Resistant Isolated Word Recognizer**

Paul, Douglas B.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 713-716; In English; See also 20060003045; Copyright; Avail.: Other Sources

Most current speech recognition systems are sensitive to variations in speaker style. The following is the result of an effort to make a Hidden Markov Model (HMM) Isolated Word Recognizer (IWR) tolerant to such speech changes caused by speaker stress. More than an order-of-magnitude reduction of the error rate was achieved for a 105 word simulated stress database and a 0% error rate was achieved for the TI 20 isolated word database.

Author

*Speech Recognition; Data Bases*

**20060003048** Texas A&M Univ., College Station, TX, USA

**Optimum Rate Allocation in Pyramid Vector Quantizer Transform Coding of Imagery**

Blain, Mary E.; Fischer, Thomas R.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 18.2.1 - 18.2.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

The optimum rate allocation is derived for pyramid vector quantization (PVQ) in transform coding of monochromatic imagery. A modification to the low-rate PVQ encoding algorithm is described, which provides improved performance. Images are encoded with both the PVQ and standard scalar quantizer transform coders, demonstrating that the PVQ coder reduces the mean-square encoding error and better preserves image edges.

Author

*Vector Quantization; Imagery; Coding*

**20060003051** Toyohashi Univ. of Technology, Aichi, Japan

**Spoken Sentence Recognition by Time-Synchronous Parsing Algorithm of Context- Free Grammar**

Nakagawa, Sei-ichi; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 20.9.1 - 20.9.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

This paper proposes a new continuous speech recognition method by phoneme-based word spotting and time synchronous context-free parsing. The word pattern is composed of the concatenation of phoneme patterns. The knowledge of syntax is given in Backus Normal Form. Therefore, our method is task-independent in terms of reference patterns and task language. The system first spots word candidates in an input sentence, and then generates a word lattice. The word spotting is performed by a dynamic time warping method. Secondly, it selects the best word sequences found in the word lattice from all possible sentences which are defined by a context-free grammar.

Author

*Speech Recognition; Time Synchronization; Sentences; Parsing Algorithms*

**20060003071** Massachusetts Inst. of Tech., Lexington, MA, USA

**Multi-Style Training for Robust Isolated-Word Speech Recognition**

Lippmann, Richard P.; Martin, Edward A.; Paul, Douglas B.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 17.4.1 - 17.4.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

A new training procedure called multi-style training has been developed to improve performance when a recognizer is used under stress or in high noise but cannot be trained in these conditions. Instead of speaking normally during training, talkers use different, easily produced, talking styles. This technique was tested using a speech data base that included stress speech produced during a workload task and when intense noise was presented through earphones. A continuous distribution talker-dependent Hidden Markov Model (HMM) recognizer was trained both normally (5 normally spoken tokens) and with multi-style training (one token each from normal, fast, clear, loud, and question-pitch talking styles). The average error rate under stress and normal conditions fell by more than a factor of two with multi-style training and the average error rate under conditions sampled during training fell by a factor of four.

Author

*Speech Recognition; Data Bases; Errors; Workloads (Psychophysiology)*

**20060003072** Computer Sciences of Australia Pty. Ltd., Australia

**A New Time-Scale Warping Algorithm and Associated Modules for Single Dimensional and Multidimensional Speech Parameter Contours**

Maheswaran, A.; Bogner, R. E.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 721-724; In English; See also 20060003045; Copyright; Avail.: Other Sources

In this paper a new sample association approach to be known as the Hilbert Warping (HW) algorithm and associated modules are described. This algorithm is chosen from the observation that signals of similar form but with different time scales appear as similar trajectories when represented by suitable two dimensional plots in the X-Y plane, and overcomes difficulties such as identification of signal endpoints and assumptions about the smooth nature of warping that are permissible, associated with dynamic programming algorithms. The HW algorithm can be applied to both single dimensional and multi-dimensional signals as in dynamic programming algorithms.

Author

*Algorithms; Dynamic Programming; Speech Recognition*

**20060003078** National Research Council of Canada, Ottawa, Ontario, Canada

**Speech Recognition Using an Auditory Model with Pitch-Synchronous Analysis**

Hunt, Melvyn J.; Lefebvre, Claude; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 813-816; In English; See also 20060003045; Copyright; Avail.: Other Sources

An auditory model with two-tone suppression has previously been shown to perform better in speech recognition experiments than a conventional filterbank representation, particularly with noisy or distorted speech. It was, however, known to have several defects including an uneven response across the spectrum and a tendency to detect harmonics of F 0 rather than F1. We show that instants of glottal excitation can be derived from the model even with noisy speech. By using this information to carry out pitch-synchronous analysis in a slightly modified model the problem of interaction with harmonics of F 0 can be solved. An analysis of the behavior of the model leads to a specification of a class of processes showing two-tone suppression and hence to a redesigned model avoiding the known defects. The pitch-synchronous analysis is then no longer necessary, but the robust indication of excitation points may have other uses. Spectrograms from the old and new models illustrate the improvements obtained.

Author

*Speech Recognition; Distortion; Harmonics*

**20060003091** American Telephone and Telegraph Co., NJ, USA

**The Aspen Parallel Computer, Speech Recognition and Parallel Dynamic Programming**

Gorin, A. L.; Shively, R. R.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 976-979; In English; See also 20060003045; Copyright; Avail.: Other Sources

The investigation of parallel computer architectures and parallel algorithms for speech recognition is important. Large vocabulary speech recognition is a computationally intensive problem, which can require orders of magnitude acceleration over a single processor to achieve real-time performance. Also, there is still much algorithm development work to be done, which requires a programmable computer rather than a fixed hardware implementation. This paper describes progress on the ASPEN parallel computer, that is applicable to signal understanding problems in general and large-vocabulary speech recognition in particular. The following will be described in this paper: the hardware architecture; the software architecture; classes of pattern recognition algorithms that are well-suited to the architecture; examples from speech recognition.

Author

*Architecture (Computers); Parallel Computers; Speech Recognition; Computer Aided Design*

**20060003095** Ecole Polytechnique Federale de Lausanne, Switzerland

**Computer Aided Implementation of Complex Algorithms on DSP's Using Automatic Scaling**

Kassapoglou, Korina; Vetterli, Martin; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 1027-1030; In English; See also 20060003045; Copyright; Avail.: Other Sources

A methodology for transforming complex floating-point algorithms into correct fixed-point DSP programs is presented. In particular, an automatic scaling scheme leading to overflow-free programs is described. Depending on the application, scaling generated automatically may either perfectly fit, or be modified in order to substantially improve accuracy. Each case is illustrated by an example (FFT and Recursive Least-Squares algorithms).

Author

*Fast Fourier Transformations; Floating Point Arithmetic; Algorithms; Computer Techniques*

**20060003097** Rheinisch Westfalische Technische Hochschule Aachen, Aachen, Netherlands

**Luminance Adaptive Chrominance Coding**

Braun, Bodo; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 1075-1078; In English; See also 20060003045; Copyright; Avail.: Other Sources

Conventional componentwise transform coding of the standard TV components YUV or YIQ respectively is considerably inefficient, processing them - in the statistical and visual sense - mutually highly dependent components separately. With luminance adapted transform coding of perceptually matched colour difference components a considerable reduction of irrelevancy and redundancy will be achieved. Thereby physical properties are taken into account as well as the structural similarity between luminance and chrominance images. Also visual cross masking effects are taken into consideration.

Author

*Coding; Luminance*

**20060003131** San Diego State Univ., San Diego, CA, USA

**Low Bit-Rate Image Encoding Techniques**

Thyagarajan, K. S.; Viswanathan, Mahesh; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 18.7.1 - 18.7.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

This paper discusses the design of a matrix quantizer to be used to encode i) homomorphically processed images, and 2) mean subtracted images. An image obtained by optical means is modeled as a product of the illumination and reflectance components. The illumination part is lowpass and the reflectance part which reveals the edge and texture details, is highpass. The homomorphic system as applied to image processing consists of a logarithmic point transformation followed by linear filtering. Homomorphic processing achieves a simultaneous dynamic range reduction and contrast enhancement. A matrix quantizer operating on such processed images is shown to achieve bit rates as low as 0.16 bpp with acceptable quality.

Author

*Coding; Dynamic Range; Homomorphisms; Image Processing*

**20060003133** San Diego State Univ., San Diego, CA, USA

**Vector Quantizer Architectures for Speech and Image Encoding**

Abut, Huseyin; Tao, Bertram P. M.; Smith, Jack L.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 18.9.1 - 18.9.4; In English; See also 20060003045; Copyright; Avail.:

Other Sources

We present a number of architectures for vector quantization (VQ) of speech and images using VLSI and VHSIC technologies. A Dual Distortion Processor Module (DPM) has been designed to compute the error vectors at a rate of 10 million vector operations per second in a systolic configuration. An array processor controller (APC) administers the system and determines the nearest neighbor matching codeword in either a full-search or a tree-search manner. A real-time system was built and tested in 0.5 bit per pixel (bpp) image coding application. We also present an architecture using VHSIC technology based on fuzzy associative memory (FAM) chips. In this case, the system has been configured in a VME bus environment and the overall number crunching task is handled by VHSIC chips.

Author

*Vector Quantization; Architecture (Computers); Speech Recognition*

**20060003135** Southern Methodist Univ., Dallas, TX, USA

**Parallel VLSI Computing Array Implementation for Signal Subspace Updating Algorithm**

Abdallah, Ali Hussein; Yu Hen, Hu; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 779-782; In English; See also 20060003045

Contract(s)/Grant(s): MDA 903-86-C-0182; ECS-8404628; DCI-8609283; Copyright; Avail.: Other Sources

This paper concerns the parallel VLSI computing array implementation for a novel signal subspace iteration algorithm (SSIA) proposed by Karasalo. Specifically, by making use of a sparse structure, a Linearly Connected VLSI computing structure is developed for the Singular Value Decomposition (SVD) operation employed in this algorithm. We first show that by making use of a sparse structure matrix the computing time of this algorithm can be reduced from  $O(N^3)$  to  $O(N^2)$  with single processors. Then we show that the parallel architecture is able to reduce the overall computing time for SVD from  $O(N^2)$  to  $O(N)$  using  $O(N)$  processors. Where  $N$  is the dimension of the signal subspace. This makes the total computing time of SSIA from  $\max(O(K^2), O(N^2K))$  with single processors to  $O(K)$  with  $O(N^2)$  processors.

Author

*Parallel Processing (Computers); Very Large Scale Integration; Architecture (Computers)*

**20060003137** Brown Univ., Providence, RI, USA

**A Real-Time Evaluation System for a Real-Time Connected-Speech Recognizer**

Miller, Susan M.; Morgan, David P.; Silverman, Harvey F.; Karam, Michael N.; Dixon, N. Rex; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 801-804; In English; See also 20060003045

Contract(s)/Grant(s): DMC-8504277; ECS-8113494; Copyright; Avail.: Other Sources

A facility for evaluating a talker-dependent, connected-speech recognition system is described. It is implemented as an independent system and interacts in parallel with a recognizer in real-time. The evaluator includes software for speech acquisition and storage, connected-speech training, data transfer to a recognizer, database queries, and statistical analysis. Important considerations in the design were the human factors of recording, talker and recording condition variability, and the embedded training paradigm. Automatic statistical analysis is derived via a simple string alignment algorithm using just the orthography. In order to demonstrate the use of this system, two experiments are described for connected-digit recognition. These results are presented as automatically-generated confusion matrices for insertion, substitution and deletion error and individual string alignments.

Author

*Real Time Operation; Speech Recognition; Statistical Analysis; Orthography*

**20060003141** NTT Electrical Communications Labs., Japan

**Japanese Linguistic Processing for Continuous Speech Recognition**

Tsuboi, Toshiaki; Tomihisa, Akihiro; Sugamura, Noboru; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 805-808; In English; See also 20060003045; Copyright; Avail.: Other Sources

A Japanese text input system using speech, which is now under development, is described. This system recognizes continuous phrase speech and translates it into Japanese text. This system is composed of two major parts, acoustic processing and linguistic processing. In the acoustic processing CV (consonant-vowel) syllables and words in continuous speech are detected by continuous dynamic programming (DP). As the result a CV lattice and a word lattice are obtained. In the linguistic processing, the CV lattice and word lattice are converted into written form. In the conversion process the word lattice is used in combination with the CV lattice to improve translation accuracy. A CV recognition accuracy of 63-83 % and a translation accuracy of 38-62 % was obtained as an experimental result.

Author

*Speech Recognition; Japan; Vowels; Linguistics*

**20060003142** Turin Univ., Italy

**Experimental Results on a Large Lexicon Access Task**

Laface, P.; Micca, G.; Pieraccini, R.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 20.4.1 - 20.4.4; In English; See also 20060003045

Contract(s)/Grant(s): ESPRIT Proj. n.26; Copyright; Avail.: Other Sources

In this paper the problem of lexical access to large vocabularies by means of a coarse phonetic description of words is addressed. A generate and test approach is used: first a set of word candidates is extracted from the lexicon by means of a broad phonetic description of the input utterance, then a more detailed stochastic model of each word in this set, based on sub-word phonetic units, is obtained, and the likelihood of the candidate words is estimated using the Viterbi algorithm. Results of the application of the method to a large vocabulary isolated word recognition task are given. The candidate lists produced in the generation phase include the correct word in 98 times out of 100, their average size is of the order of 50 items for a 1011 word lexicon, while they do not exceed 300 units for a 13748 word lexicon.

Author

*Mathematical Models; Stochastic Processes; Phonetics*

**20060003148** BBN Systems and Technologies Corp., Cambridge, MA, USA

**Efficient Implementation of Continuous Speech Recognition on a Large-Scale Parallel Processor**

Kimball, Owen; Cosell, Lynn; Schwartz, Richard; Krasner, Michael; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 852-855; In English; See also 20060003045

Contract(s)/Grant(s): N00039-85-C-0313; Copyright; Avail.: Other Sources

This paper presents research into the use of large-scale parallelism for a continuous speech recognition algorithm. The algorithm, developed for the BBN Byblos system [1], uses context dependent Hidden-Markov models to achieve high recognition accuracy. The multiprocessor used in the research, the BBN Butterfly TM Parallel Processor, is a shared memory, ESA machine. The algorithm was implemented using the Uniform System software methodology, a system that simplifies parallel programming without sacrificing efficiency. The algorithm is described, highlighting those portions critical to an efficient parallel implementation. Some of the problems encountered in trying to improve efficiency are presented as well as the solutions to those problems. The algorithm is shown to achieve 79% processor utilization on a 97-node Butterfly Parallel Processor. This is equivalent to a speedup by a factor of 77 over a single processor benchmark.

Author

*Parallel Processing (Computers); Speech Recognition; ESA (Computers); Multiprocessing (Computers); Parallel Programming*

**20060003167** Vermont Univ., Burlington, VT, USA

**Performance Characteristics and Speed-Up Rates of the NEC mPD7281 Data Flow Processor in Parallel Processing**

Mirchandani, Gagan; McGuire, Gerald A.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 1015-1018; In English; See also 20060003045; Copyright; Avail.: Other Sources

This paper examines the use of the NEC mPD7281 programmable signal processor in a multiprocessor configuration, for the execution of digital signal processing algorithms. Speed-up rates and effects of multiprocessor communication on speed-up

rates are determined for FIR, IIR and the LMS adaptive filtering algorithms using the software simulator and assembler.

Author

*Parallel Processing (Computers); Signal Processing; Algorithms; Adaptive Filters; Multiprocessing (Computers); Information Flow*

**20060003172** Wright State Univ., Dayton, OH, USA

**Performance of Schur's Algorithm on an Optically Connected Multiprocessor Multirate Process Scheduling and Synchronization in Distributed Signal Processors**

McAulay, Alastair d.; Parsons, Eric A.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 24.2.1 - 24.2.4; In English; See also 20060003045

Contract(s)/Grant(s): N00014-85-C-0755; Copyright; Avail.: Other Sources

This paper extends earlier concepts for autoregressive computation on an optical crossbar interconnected parallel processor. The dataflow architecture uses optical coupling to provide reconfigurable interconnections. Processing elements are reconfigured to perform different functions by downloading microcode. Sehur's algorithm is modeled for  $N = 5$ , in both rolled and unrolled implementations using a dataflow simulator. The unrolled version uses 100 processing elements to solve one set of inputs per clock after a latency of 44 clocks. Each solution processes only 11 input values to produce the 6 output values, thus minimizing I/O bandwidth.

Author

*Algorithms; Multiprocessing (Computers); Optical Data Processing; Parallel Processing (Computers); Signal Processing; Bandwidth*

**20060003182** Technische Hogeschool, Delft, Netherlands

**Multi-Pulse and Regular-Pulse Coding of Images**

Horne, Caspar; Deprettere, Ed F.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 25.9.1 - 25.9.4; In English; See also 20060003045

Contract(s)/Grant(s): STW DEL 44.0643; Copyright; Avail.: Other Sources

Images can be effectively and efficiently modeled as a random output field of a non-constant spectral shaping filter input with a certain low bit rate excitation field. The shaping filter is taken to be the inverse of a field-adaptive linear prediction filter. The excitation field is taken to be a closed-loop weighted approximation of the LP residual. In this paper, we focus on approximations that are field extensions of 1D so-called Multi- Pulse and Regular-Pulse excitations that have been successfully applied in weighted analysis-by-synthesis speech coding algorithms.

Author

*Coding; Images; Linear Prediction; Pulses*

**20060003189** NTT Electrical Communications Labs., Tokyo, Japan

**A VQ-Based Preprocessor Using Cepstral Dynamic Features for Large Vocabulary Word Recognition**

Furui, Sadaoki; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 1127-1130; In English; See also 20060003045; Copyright; Avail.: Other Sources

This paper proposes a new VQ (Vector Quantization)- based preprocessor for use in a method which reduces the amount of computation necessary in speaker-independent large vocabulary isolated word recognition. A speech wave analyzed by time functions of instantaneous cepstrum coefficients and short-time regression coefficients for both cepstrum coefficients and logarithmic energy. A universal codebook for these time functions is constructed based a multi-speaker, multi-word database. Next, a separate codebook is designed as a subset of the universal codebook each word in the vocabulary. These word-specific codebooks are used for front-end preprocessing to eliminate word candidates whose distance scores are large. A dynamic time-warping processor based on a word dictionary, which each word is represented as a time-sequence of the universal codebook elements (SPLIT method), then resolves choice among the remaining word candidates. Effectiveness of this method has been ascertained by recognition experiments using a database consisting of words from a vocabulary of 100 Japanese city names uttered 20 male speakers.

Author

*Cepstral Analysis; Computation; Preprocessing; Wave Functions*

**20060003658** Fondazione Ugo Bordoni, Rome, Italy

**Average Power Density Spectrum At The Output Of Two-Port Strictly-Recursive Modulo-2 Sequential Networks**

Brugia, Odoardo; Campanini, Giovanni; Wolfowicz, William; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 844-847; In English; See also 20060003631; Copyright; Avail.: Other Sources

Autocorrelation and average power density spectrum at the output of 2-port strictly-recursive modulo-2 sequential networks are expressed as functions of the impulse response period, of the number of 1's included in one period, and of the input statistics. Examples concerned with Class-4 partial-response coding and AMI coding of scrambled sequences are developed.

Author

*Power Spectra; Density (Number/Volume); Autocorrelation*

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### COMPUTER SYSTEMS

Includes computer networks and distributed processing systems. For information systems see *82 Documentation and Information Science*. For computer systems applied to specific applications, see the associated category.

**20060002954** Deutsches Elektronen-Synchrotron, Hamburg, Germany

#### **Methodologies and Techniques for Analysis of Network Flow Data**

Bobyshev, A.; Grigoriev, M.; January 2005; 8 pp.; In English

Report No.(s): DE2005-15016955; FERMILAB-CONF-04-459; No Copyright; Avail.: National Technical Information Service (NTIS)

Network flow data gathered at the border routers and core switches is used at Fermilab for statistical analysis of traffic patterns, passive network monitoring, and estimation of network performance characteristics. Flow data is also a critical tool in the investigation of computer security incidents. Development and enhancement of flow based tools is an on-going effort. This paper describes the most recent developments in flow analysis at Fermilab.

NTIS

*Computer Information Security; Computer Networks*

**20060003179** Seoul National Univ., Seoul, Korea, Republic of

#### **Real Time Implementation of Block Truncation Coding for Picture Data Compression**

Ko, Hyung Hwa; Lee, Choong Woong; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 25.5.1 - 25.5.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

This paper describes the implementation of absolute moment block truncation coding (AMBTC) in real time for the moving picture data compression. Using the AMBTC algorithm, we have realized and operated a system for an NTSC TV signal and obtained quite an excellent performance. All circuits are implemented in the wrapping method, and the highest processing clock rate is 10.7 MHz (3 fsc). The sampling rate is 5.35 MHz. The system implemented by hardwares excluding software manipulation, which contains five subblocks performs well to get the compressed data rate of 2.0 bits/pal. The quality of the processed picture is more or less degraded but not objectionable.

Author

*Coding; Data Compression; Approximation; Real Time Operation; Algorithms*

**20060003743** National Technical Univ., Athens, Greece

#### **General Results On The Capacity Assignment Problem In Computer Communication Networks**

Sykas, E. D.; Protonotarios, E. N.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1001-1004; In English; See also 20060003631; Copyright; Avail.: Other Sources

The Capacity Assignment Problem in a packet switching communication network is examined with a new look and under general assumptions about the form of the network cost function and a general class of delay measures. Four optimal functions: the optimal delay (cost) function giving the minimum delay (cost) versus the maximum permissible cost (delay), and the optimal capacities versus the maximum permissible cost or delay, are defined. Several propositions describing the relations between these functions are given and their form is found if a separability property holds. The relations between different versions of the CAP are given together with sufficient conditions for the uniqueness of the solution. Finally, an algorithm appropriate for the solution of the CAP under minimax delay criteria is presented and analyzed.

Author

*Minimax Technique; Packet Switching; Communication Networks; Interprocessor Communication; Algorithms*

## CYBERNETICS, ARTIFICIAL INTELLIGENCE AND ROBOTICS

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also 54 *Man/System Technology and Life Support*.

**20060003061** International Business Machines Japan Ltd., Japan

### **HMM-Based Speech Recognition Using Multi-Dimensional Multi-Labeling**

Nishimura, Masafumi; Toshioka, Koichi; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 27.11.1 - 27.11.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

This paper describes a new vector quantization (VQ; so-called labeling) method of a speech recognition system based on hidden Markov model (HMM). For improving the VQ accuracy in a simple manner, 'multi-labeling' which generates multiple labels at each frame was introduced while keeping a conventional HMM formulation. Furthermore, in order to represent characteristics of speech accurately and effectively 'multi-dimensional labeling' was also introduced which quantizes multiple features such as spectral dynamics and spectrum independently. This labeling method was tested in an isolated word recognition task using 150 Japanese confusable words. The recognition error rate was roughly reduced to 1/2 or less compared with the conventional method.

Author

*Japan; Speech Recognition; Words (Language)*

**20060003062** Polytechnic Univ., Brooklyn, NY, USA

### **Multiple Input Adaptive Iterative Image Restoration Algorithms**

Katsaggelos, Aggelos K.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 28.1.1 - 28.1.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

In this paper image restoration applications where multiple distorted versions of the same original image are available are considered. A general adaptive iterative restoration algorithm is derived based on regularization techniques. The adaptivity of the algorithm is introduced in two ways: a) by a constraint operator which incorporates properties of the response of the human visual system into the restoration process, and b) by a weight matrix which assigns greater importance for the deconvolution process to areas of high spatial activity than to areas of low spatial activity. Different degrees of trust are assigned to the various distorted images depending on the amount of noise on each image. The proposed algorithms are general and can be used for any type of linear distortion and constraint operators. It can also be used to restore signals other than images.

Author

*Algorithms; Restoration; Image Analysis*

**20060003096** Siemens A.G., Munich, Germany

### **Hierarchical Encoding of Image Sequences Using Multistage Vector Quantization**

Hammer, B.; Brandt, A. v.; Schielein, M.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 25.2.1 - 25.2.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

Vector quantization is a promising encoding technique especially for low data rate image transmission. Due to the exponential growing of its computational complexity with the block dimension, however, only small block sizes have been used in practical applications. This restricts the coding efficiency and produces some blockiness in the reconstructed images. Our proposal solves this problem by a combination of a block-overlapping pyramidal transform with multistage VQ. This concept enables VQ of large blocks in a hierarchical manner with small computational costs, while the block-overlapping principle gives rise to a smooth image reconstruction. The simulation results proved that picture phone sequences are reconstructed without any annoying artifacts.

Author

*Coding; Sequencing; Vector Quantization*

**20060003102** Speech Technologies Lab., Santa Barbara, CA, USA

### **Weighted Cepstral Distance Measures in Vector Quantization Based Speech Recognizers**

Applebaum, Ted H.; Hanson, Brian A.; Wakita, Hisashi; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 27.9.1 - 27.9.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

Other Sources

This paper extends the use of weighted cepstral distance measures to speaker independent word recognizers based on

vector quantization. Recognition results were obtained for two recognition methods: dynamic timewarping of vector codes and hidden Markov modeling. The experiments were carried out on a vocabulary of the ten digits and the word 'oh'. Two kinds of spectral analysis were considered: LPC, and a recently proposed, low dimensional, perceptually based representation (PLP). The effects of analysis order and varying degrees of quantization in the spectral representation were also considered. Recognition experiments indicate that the performance of the weighted cepstral distance with vector quantized spectral data is considerably different from that previously reported for unquantized data. Comparison of recognition rates shows wide variations due to interaction of the distance measure with the analysis technique and with vector quantization. The best recognition scores were obtained by the combination of weighted cepstral distance and low order PLP analysis. This combination maintained good recognition rates down to very low (16 or 8 codes) codebook sizes.

Author

*Cepstral Analysis; Vector Quantization; Words (Language); Emission Spectra*

**20060003124** American Telephone and Telegraph Co., NJ, USA, Massachusetts Inst. of Tech., Cambridge, MA, USA

**Beyond Quasi-Stationarity: Designing Time-Frequency Representations for Speech Signals**

Riley, Michael D.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 657-660; In English; See also 20060003045; Copyright; Avail.: Other Sources

This work addresses two related questions. The first is what joint time-frequency energy representations are most appropriate for speech signals, in particular, for the analysis of formant structure. Quasi-stationarity is not assumed, since it neglects dynamic regions. A set of desired properties is proposed, and a subclass of the quadratic transforms that best meets these criteria is derived, which consists of two-dimensionally smoothed Wigner distributions with gaussian kernels. The second question addressed is how to obtain suitable symbolic descriptions of the phonetically relevant features in these time-frequency surfaces. We propose time-frequency ridges in these surfaces, the 2-D analog of spectral peaks, which can be found by examining the derivatives of the time-frequency surface produced above.

Author

*Frequencies; Speech Recognition*

**20060003134** Institut National de la Recherche Scientifique, Montreal, Quebec, Canada

**Integration of Acoustic Information in a Large Vocabulary Word Recognizer**

Gupta, V. N.; Lennig, M.; Mermelstein, P.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 697-700; In English; See also 20060003045; Copyright; Avail.: Other Sources

This paper proposes a new way of using vector quantization for improving recognition performance for a 60,000 word vocabulary speaker-trained isolated word recognizer using a phonemic Markov Model approach to speech recognition. We show that we can effectively increase the codebook size by dividing the feature vector into two vectors of lower dimensionality, and then quantizing and training each vector separately. For a small codebook size, integration of the results of the two parameter vectors provides significant improvement in recognition performance as compared to the quantizing and training of the entire feature set together. Even for a codebook size as small as 64, the results obtained when using the new quantization procedure are quite close to those obtained when using Gaussian distribution of the parameter vectors.

Author

*Speech Recognition; Words (Language); Acoustic Frequencies*

**20060003156** SRI International Corp., USA

**Lexical Access with Lattice Input**

Murveit, Hy; Weintraub, Mitchel; Cohen, Michael; Bernstein, Jared; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 20.11.1 - 20.11.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

This paper describes an alternative approach to lexical access in the CMU ANGEL speech recognition system. Using this approach, the asynchronous phonetic hypotheses generated by an acoustic-phonetics module are converted to a directed graph. This graph is compared to a pronunciation dictionary. Performance results for this approach and the original CMU approach are similar. An error analysis indicated promises directions for further work.

Author

*Graph Theory; Phonetics; Speech Recognition*

**20060003195** Georgia Inst. of Tech., Atlanta, GA, USA

**Hidden Markov Model Speech Recognition Based on Kalman Filtering**

Clements, Mark A.; Lim, Sungjae; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 1147-1150; In English; See also 20060003045; Copyright; Avail.: Other Sources

Traditional hidden Markov model speech recognition is generally based on a set of parameters (often LPC related) which are extracted at discrete intervals. Such an analysis necessitates use of a discrete-trial, hidden Markov model in which the underlying states can only change at intervals related to the frame rate of the analysis. The exact locations of the analysis windows used can influence the front-end outputs and a result can cause confusion between words differing in short-duration consonants. In the current study, an alternate method which does not require segmentation is proposed, and a simple version is implemented. The discrete trial hidden Markov model algorithms are adapted to this framework leading to significantly improved recognition performance.

Author

*Kalman Filters; Speech Recognition; Words (Language)*

**20060003198** Speech Technologies Lab., Santa Barbara, CA, USA

**An Efficient Speaker-Independent Automatic Speech Recognition by Simulation of Some Properties of Human Auditory Perception**

Hermansky, Hynek; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 1159-1162; In English; See also 20060003045; Copyright; Avail.: Other Sources

An auditory model of speech perception, the Perceptually based linear predictive analysis of Root power sum metric (PLP-RPS), is applied as the front-end of an automatic speech recognizer (ASR). The PLP-RPS front-end is compared with standard linear predictive-cepstral metric (LP-CEP) front-end, and with LP-RPS and PLP-CEP front-ends. The two-spectral-peak models are the most efficient in modeling of linguistic information in speech. Consequently, in speaker-independent ASR, high analysis order front-ends are less effective than low-order front-ends. Synthetic speech is used for front-end evaluation. Some of perceptual inconsistencies of standard LP front-ends are alleviated in PLP front-ends. The PLP-RPS front-end is most sensitive to harmonic structure of speech spectrum. Perceptual experiments indicate similar tendencies in human auditory perception.

Author

*Auditory Perception; Cepstral Analysis; Simulation; Speech Recognition*

**64**

**NUMERICAL ANALYSIS**

Includes iteration, differential and difference equations, and numerical approximation.

**20060002860** Lawrence Livermore National Lab., Livermore, CA USA

**Nonlinear Seismic Analysis of Morrow Point Dam: A Study of the USA Bureau of Reclamation**

Noble, C.; Solberg, J.; Mar. 2004; 194 pp.; In English

Report No.(s): DE2005-15013970; UCRL-TR-202545; No Copyright; Avail.: National Technical Information Service (NTIS)

This research and development project was sponsored by the USA Bureau of Reclamation (USBR), who are best known for the dams, power plants, and canals it constructed in the 17 western states. The mission statement of the USBRs Dam Safety Office, located in Denver, Colorado, is to ensure Reclamation dams do not present unacceptable risk to people, property, and the environment. The Dam Safety Office does this by quickly identifying the dams which pose an increased threat to the public, and quickly completing the related analyses in order to make decisions that will safeguard the public and associated resources. The research study described in this report constitutes one element of USBRs research and development work to advance their computational and analysis capabilities for studying the response of dams to strong earthquake motions. This project focused on the seismic response of Morrow Point Dam, which is located 263 km southwest of Denver, Colorado.

NTIS

*Dams; Earth Movements; Nonlinear Systems; Nonlinearity; Reclamation; United States*

**20060003049** Mitsubishi Electric Corp., Amagasaki, Japan

**A Design Method of Systolic Arrays under the Constraint of the Number of the Processors**

Horiike, Satoshi; Nishida, Shogo; Sakaguchi, Toshiaki; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 764-767; In English; See also 20060003045; Copyright; Avail.: Other Sources

This paper proposes a systematic method to design systolic arrays under the constraint of the number of the processors. Our basic approach is to partition the large systolic array into the smaller number of groups, whose number is coincident with the number of processors to be used. We give the mathematical method to make at most one processor execute computation in each group. Then, each group can be replaced by one processor to satisfy the constraint of the number of the processors.

Author

*Computation; Systolic Arrays; Design Analysis; Algorithms*

**20060003050** Indian Inst. of Science, Bangalore, India

**On a Programmable Signal Processor for VLSI**

Srinivasa, N.; Rajgopal, K.; Ramakrishnan, K. R.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 795-796; In English; See also 20060003045; Copyright; Avail.: Other Sources

This paper presents a method of designing a programmable signal processor based on a bit parallel matrix vector matrix multiplier (linear transformer). The salient feature of this design is that the efficiency of the direct vector matrix multiplier is improved and VLSI design is made much simpler by trading off the more expensive arithmetic operation (multiplication) for 'cheaper' manipulation (addition/subtraction) of the data.

Author

*Very Large Scale Integration; Signal Analyzers; Signal Processing*

**20060003053** Erlangen-Nuernberg Univ., Erlangen, Germany

**A Novel Approach for Complex Chebyshev-Approximation with FIR Filters Using the Remez Exchange Algorithm**

Preuss, Klaus P.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 21.1.1 - 21.1.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

The long standing problem of the approximation of a complex-valued desired frequency response using FIR filters is investigated again. The resulting complex error is minimized in the Chebyshev sense. The proposed algorithm deals directly with the complex error function, which is a linear one. This will be done by formulating a complex interpolation task. Additionally the introduction of a complex weighting function allows a different weighting of the magnitude and the phase error. The applied method can be characterized as a generalization of the Remez exchange algorithm for a complex weighted Chebyshev-approximation. The algorithm allows the design of filters with complex as well as real coefficients at high convergence speed. The well known Chebyshev design of exactly linear phase FIR filters with real coefficients is included as a special case.

Author

*Chebyshev Approximation; Algorithms; Frequency Response*

**20060003054** Erlangen-Nuernberg Univ., Erlangen, Germany

**On the Design of Recursive Hilbert-Transformers**

Schuessler, H. W.; Weith, J.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 21.2.1 - 21.2.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

The design of a recursive Hilbert-transformer is presented with exact magnitude response and Chebyshev approximation of the desired phase. A comparison is made with designs known so far.

Author

*Chebyshev Approximation; Transformers*

**20060003057** Boston Coll., Chestnut Hill, MA, USA

**Estimating Decay Rates of Single-Frequency Causal AR Filters Using a 'Decimation' Method**

Grossbard, Neil J.; Retterer, John M.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 988-990; In English; See also 20060003045; Copyright; Avail.: Other Sources

A method of analysis will be presented which is both efficient and accurate when applied to the problem of estimating decay rate of single-frequency weakly damped causal AR filters. The method relies on using  $D$  disjoint subsets of the original data set. A subset is formed by taking values of the original data at a sample rate,  $D$ , and these subsets cover the original data set. This  $D$  is called the 'decimation' rate and the approach is called the 'decimation' method.

Author

*Decay Rates; Time Series Analysis; Estimating; Rates (Per Time)*

**20060003058** Florida Univ., Gainesville, FL, USA

**High-Speed Wigner Processing Based on a Single Modulus Quadratic Residue Number System**

Wilbur, J.; Taylor, F. J.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 24.5.1 - 24.5.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

The discrete Wigner distribution (DWD) has become an established DSP tool. A generalized form of the DWD, termed the smoothed-pseudo-DWD (SPDWD), has been offered in the literature and shown to have several attractive features. In this work, an implementation for an SPDWD processor is provided. The SPDWD processor uses the single-modulus quadratic number system, an alternative numbering system which reduces multiplies. The symmetry property of the SPDWD kernel is used to further reduce computations.

Author

*Fast Fourier Transformations; Discrete Functions; Probability Distribution Functions; Rates (Per Time); Residues; High Speed*

**20060003066** Northeastern Univ., Boston, MA, USA

**Set-Membership Theory Applied to the Linear Predictive Analysis of Speech**

Deller, J. R.; Luk, T. C.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 15.8.1 - 15.8.4; In English; See also 20060003045

Contract(s)/Grant(s): NSF ECS-82-03289; NSC ECS-80-06866; Copyright; Avail.: Other Sources

The theory of set membership (SM) identification is formulated, and applied to linear prediction (LP) analysis of speech. The LP parameters of a simulated vowel are identified as an illustration. The SN strategy results in a significant computational savings due to rejection of data which are informationless in the SM sense. t

Author

*Time Series Analysis; Set Theory; Linear Prediction; Vowels*

**20060003073** Massachusetts Univ., North Dartmouth, MA, USA, Information Research Lab., Inc., Dartmouth, MA, USA

**Laplacian Pyramid Image Data Compression**

Chen, C. H.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 737-739; In English; See also 20060003045; Copyright; Avail.: Other Sources

With the growing demand for image processing, efficient image data compression techniques are much needed for image data transmission and storage. Two image data compression techniques based on the Laplacian Pyramids are examined: the Laplacian Pyramid Vector Quantization (LPVQ) and the Laplacian Pyramid Predictive Compression (LPPC). The LPVQ can provide a reduction from 8 bits per pixel (bpp) to 0.45 bpp with negligible degradation in image quality (0.6% rms reconstruction error), as shown in a test image. The LPPC can provide comparable performance with a proper choice of image model. Both techniques thus can be superior to existing transform coding and predictive compression techniques. The problems of additive noise, pre-and post-processing and hardware realization are also considered.

Author

*Laplace Equation; Image Processing; Image Resolution; Prediction Analysis Techniques*

**20060003075** Technical Univ. of Munich, Munich, Germany

**A Systolic Algorithm for Cyclic-By-Rows SVD**

Schwiegelshohn, Uwe; Thiele, Lothar; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 19.2.1 - 19.2.3; In English; See also 20060003045; Copyright; Avail.: Other Sources

This paper presents an algorithm which is essentially equivalent to Jacobi-type algorithms with a cyclic-by-rows iteration scheme but also enables a fast parallel and systolic computation. Further, a comparison with other parallel algorithms for the same problem is provided. At last a systolic array is derived which requires  $(n+1)2/4$  processor cells and has a time complexity of  $O(n)$  for each sweep.

Author

*Algorithms; Systolic Arrays*

**20060003077** Technical Univ. of Munich, Munich, Germany

**One- and Two-Dimensional Systolic Arrays for Least-Squares Problems**

Schwiegelshohn, Uwe; Thiele, Lothar; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 791-794; In English; See also 20060003045; Copyright; Avail.: Other Sources

In this paper homogeneous systolic solutions to overdetermined systems of linear equations are described. The least-squares problem (LSP) can be solved on two-dimensional mesh-connected or hexagonal arrays. Simple partitioning schemes can be applied to solve large-scale problems. A general systematic method is given to derive linear processor arrays from given two-dimensional ones. This hierarchical approach leads to one-dimensional systolic arrays for the LSP with advantageous properties. The data occur in a lexicographical input/output scheme and pipelined arithmetic units can be used.

Author

*Linear Arrays; Linear Equations; Systolic Arrays*

**20060003079** Bell Telephone Labs., Inc., Murray Hill, NJ, USA

**An Investigation on the Use of Acoustic Sub-Word Units for Automatic Speech Recognition**

Wilpon, J. G.; Juang, B. H.; Rabiner, L. R.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 20.7.1 - 20.7.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

An approach to automatic speech recognition is described which attempts to link together ideas from pattern recognition such as dynamic time warping and hidden Markov modeling, with ideas from linguistically motivated approaches. In this approach, the basic sub-word units are defined acoustically, but not necessarily phonetically. An algorithm was developed which automatically decomposed speech into multiple sub-word segments, based solely upon strict acoustic criteria, without any reference to linguistic content. By repeating this procedure on a large corpus of speech data we obtained an extensive pool of unlabeled sub-word speech segments. Then using well defined clustering techniques, a small set of representative acoustic sub-word units (e.g. an inventory of units) was created. This process is fast, easy to use, and required no human intervention.

Author

*Speech Recognition; Words (Language); Linguistics*

**20060003092** BBN Systems and Technologies Corp., Cambridge, MA, USA

**On Matching Correlation Sequences by Parametric Spectral Models**

Makhoul, John; Steinhardt, Allan O.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 995-998; In English; See also 20060003045; Copyright; Avail.: Other Sources

The correlation matching property of all-pole models does not extend readily to pole-zero models. We prove that, if the number of poles in a pole-zero model is strictly less than the number of given correlations, a pole-zero model that matches the given correlations may not exist, irrespective of the number of zeroes in the model. We also show that, if we add a set of cepstral constraints, a maximum-entropy pole-zero model that matches the correlation and cepstral constraints may not exist. We conclude that pole-zero modeling based on minimizing some error criterion might be preferable to exact constraint matching.

Author

*Spectral Correlation; Maximum Entropy Method; Sequencing; Errors*

**20060003116** California Univ., Berkeley, CA, USA

**Fuzzy Vector Quantization Applied to Hidden Markov Modeling**

Tseng, Ho-Ping; Sabin, Michael J.; Lee, Edward A.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 15.5.1 - 15.5.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

This paper investigates the use of a fuzzy vector quantizer (FVQ) as the front end for a hidden Markov modeling (HMM) scheme for isolated word recognition. Unlike a standard vector quantizer that generates the index of a single codeword that best matches an input vector, an FVQ generates a vector whose components represent the degree to which each codeword matches the input vector. The HMM algorithm is generalized to accommodate the FVQ output. This approach is tested on a database of isolated words from a single male speaker. It is seen that the FVQ front end significantly reduces the amount of data needed to train the HMM algorithm.

Author

*Vector Quantization; Fuzzy Systems; Algorithms; Markov Processes*

**20060003119** Trinity Coll., Hartford, CT, USA

**Power Spectrum Estimation with Uncertainty in the Sample Location of Correlation Measurements**

Ning, Taikang; Nikias, Chrysostomos L.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 16.1.1 - 16.1.4; In English; See also 20060003045

Contract(s)/Grant(s): N00014-86-K-0219; Copyright; Avail.: Other Sources

Most power spectrum estimation methods such as Pisarenko, Maximum Entropy, and conventional methods, assume that the given correlation functions are uniformly sampled in location. The situation where correlation functions are uniformly sampled but with uncertainty in their sample location has been overlooked by the spectrum estimation community. In this paper, the effects upon spectrum estimates are derived when there is location uncertainty in the correlation functions. To alleviate these effects, a modified approach that takes into account the uncertainty is developed. Simulation examples are given to demonstrate the uncertainty effects and to justify the improvements gained by using the new approach.

Author

*Power Spectra; Estimates; Maximum Entropy Method; Uncertain Systems*

**20060003120** Arizona State Univ., Tempe, AZ, USA

**Accurate Estimation of Closely-Spaced, Real, Decaying Exponentials in Noise**

Sohie, Guy R. L.; Mirchandani, A.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 669-672; In English; See also 20060003045; Copyright; Avail.: Other Sources

The problem of estimating the time constants of real, decaying exponentials in noise is investigated. Specifically, algebraic characterization using singular value decomposition of the correlation matrix of the data is employed. An alternate, weighted minimum-norm solution, based on a Z-plane mapping, is introduced. Improvement of performance over the traditional minimum-norm solution is illustrated.

Author

*Estimating; Time Constant; Maximum Likelihood Estimates; Algebra; Characterization; Decomposition; Signal to Noise Ratios*

**20060003125** Massachusetts Inst. of Tech., Lexington, MA, USA

**Two-Stage Discriminant Analysis for Improved Isolated-Word Recognition**

Martin, Edward A.; Lippmann, Richard P.; Paul, Douglas B.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 709-712; In English; See also 20060003045; Copyright; Avail.: Other Sources

This paper describes a two-stage isolated word speech recognition system that uses a Hidden Markov Model (HMM) recognizer in the first stage and a discriminant analysis system in the second stage. During recognition, when the first-stage recognizer is unable to clearly differentiate between acoustically similar words such as 'go' and 'no' the second-stage discriminator is used. The second-stage system focuses on those parts of the unknown token which are most effective at discriminating the confused words. The system was tested on a 35 word, 10,710 token stress speech isolated word data base created at Lincoln Laboratory. Adding the second-stage discriminating system produced the best results to date on this data base, reducing the overall error rate by more than a factor of two.

Author

*Discriminant Analysis (Statistics); Speech Recognition; Words (Language); Markov Processes*

**20060003130** Lowell Univ., MA, USA

**An Efficient Pyramid Image Coding System**

Anh, Tran; Kwun-Min, Liu; Kou-Hu, Tzou; Vogel, Elleen B.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 744-747; In English; See also 20060003045; Copyright; Avail.: Other Sources

The pyramid image structure can be naturally adapted for progressive image transmission over low-speed channels and hierarchical image retrieving in computerized image archiving. An efficient pyramid image coding system using quadrature mirror filters to form the image-pyramids is proposed in this paper. Characteristics of the image-pyramids are presented. Since the Laplacian pyramids of most nature images contain sparse and spatially concentrated data, a combined run-length coding for zero-valued elements and entropy coding for elements larger than a certain threshold is employed. The textural features in the Laplacian pyramids suggest that coding techniques pursuing spatial correlation may be advantageous. Therefore, vector quantization is chosen to code the Laplacian pyramids. Simulation results have shown that simple vector quantization accomplished significant bit-rate reduction over scalar quantization. The proposed system has also shown good-quality reproduction at bit rates lower than 1 bit/pixel.

Author

*Coding; Vector Quantization; Pyramids*

**20060003136** Beijing Inst. of Post and Telecommunications, China

**A Hidden Markov Model Applied to Chinese Four-Tone Recognition**

Xi-Xian, Chen; Chang-Nian, Cai; Peng, Guo; Ying, Sun; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 797-800; In English; See also 20060003045; Copyright; Avail.: Other Sources

In this paper, we present a probabilistic approach to Chinese four-tone recognition in which the well-known technique of a hidden Markov model is used. For each tone, a distinct hidden Markov model (HMM) is produced by using the Baum's forward-backward algorithm based upon the artificial (simulated) training sequences. Classification can be made by computing the probability of generating the test utterance with tone model and choosing as the recognized the one corresponding to the model with the highest probability score. The recognition accuracies were found to be 98% for 35 Chinese phonetic alphabets pronounced by standard Chinese speakers and 96% for Chinese digits pronounced by research group.

Author

*Markov Processes; Probability Theory; Speech Recognition; China*

**20060003143** Siemens Corp. Research, Princeton, NJ, USA

**Continuous Digit Recognition Using Coarse Phonetic Segmentation**

Lubensky, David; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 817-820; In English; See also 20060003045; Copyright; Avail.: Other Sources

This paper describes a robust speaker dependent continuous digit recognition system which runs in real time on a 16-bit micro-processor. An important design goal was the efficient use of available processing resources. The decision-making steps are ordered according to the degree of difficulty and the amount of processing required. The system uses dynamic time alignment only selectively and locally, relying on lexical constraints imposed in the form of coarse phonetic transcription and a pre-classification step which does not require costly time warping in pattern matching. The system achieved 96.5% string accuracy and 99.1% digit accuracy on 540 digit strings (average length of 4 digits) collected from six speakers (4 male, 2 female).

Author

*Robustness (Mathematics); Pattern Recognition; Microprocessors*

**20060003144** Fujitsu Ltd., Kawasaki, Japan

**Extraction of Phonemic Variation Rules in Continuous Speech Spoken by Multiple Speakers**

Kimura, Shinta; Nara, Yasuhiro; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 20.8.1 - 20.8.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

This paper describes an interactive extraction of phonemic variation rules in continuous speech spoken by multiple speakers. To realize a continuous speech recognizer, must first develop a highly accurate phoneme recognizer. The major problem related to phoneme recognizers is the phonemic variations in continuous speech. Our work focuses on the interactive analysis of phonemic variations in continuous speech and the extraction of the phonemic variation rules for many speakers. We extracted 317 rules related to 21 kinds phonemic variation phenomena from 10,000 Japanese-language phrases spoken by 10 male speakers. With these rules, 97.6% of 36,000 Japanese-language phrases spoken by 36 test speakers (30 males and 6 females) were correctly segmented by our top-down phoneme segmentation system. Furthermore, a subset of the rules for each speaker was automatically obtained. On average, each subset contains 53.2% of the rules.

Author

*Extraction; Speech; Segments*

**20060003146** Philips G.m.b.H., Germany

**Data-Driven Organization of the Dynamic Programming Beam Search for Continuous Speech Recognition**

Ney, H.; Mergel, D.; Noll, A.; Paeseler, A.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 833-836; In English; See also 20060003045

Contract(s)/Grant(s): 413-5839-ITM 8401; Copyright; Avail.: Other Sources

This paper describes a data-driven organization of the dynamic programming beam search for large vocabulary, continuous speech recognition. This organization can be viewed as an extension of the one-pass dynamic programming algorithm for connected word recognition. In continuous speech recognition we are faced with a huge search space, and search hypotheses have to be formed at the 10-ms level. The organization of the search presented has the following characteristics. Its computational cost is proportional only to the number of hypotheses actually generated and is independent of the overall size

of the potential search space. There is no limit on the number of word hypotheses, there is only a limit to the overall number of hypotheses due to memory constraints. The implementation of the search has been studied and tested on a continuous speech data base comprising 20672 words.

Author

*Algorithms; Data Bases; Dynamic Programming; Speech Recognition*

**20060003149** Carnegie-Mellon Inst. of Research, Pittsburgh, PA, USA

**Prosodic Knowledge Sources for Word Hypothesization in a Continuous Speech Recognition System**

Waibel, Alex; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 856-859; In English; See also 20060003045

Contract(s)/Grant(s): F33615-78-C-1551; MCS-7825824; Copyright; Avail.: Other Sources

Previously we have reported on the extraction of prosodic cues (such as stress, pitch, duration) from continuous speech and have reported on possible uses of some prosodic information in large vocabulary word recognition system. In this paper we extend these previous findings to a speaker-independent continuous speech recognition system. Speaker-independent knowledge sources (KS) were implemented that attempt to hypothesize words based on only prosodic cues found in the signal. The prosodic cues exploited were temporal cues (syllable durations, ratios of unvoiced segment durations to syllable durations, voiced segment durations), intensity profiles and likelihoods of stressedness. Each KS extracts the appropriate prosodic cue and searches its knowledge base for words whose prosodic patterns satisfy the constraints found in the signal. Using a multi-speaker continuous speech database for evaluation, each prosodic KS is shown to hypothesize the correct word substantially better than chance. All prosodic KSs were then combined and compared with a speaker independent acoustic-phonetic word hypothesizer. After applying the prosodic KSs, the correct word ranked on average 25th (out of 252 words). The acoustic-phonetic KS alone yielded an average rank of 40 (out of 252) without the addition of prosodic information. After prosodic and phonetic KSs were combined the average rank was reduced to 15 out of 252. The results indicate that prosodic information indeed adds complementary information that substantially improves word hypothesization in speaker-independent continuous speech recognition systems.

Author

*Data Bases; Knowledge Based Systems; Speech Recognition*

**20060003150** Purdue Univ., West Lafayette, IN, USA

**Speaker-Independent Recognition of Stop Consonants**

Yoder, Sarah K.; Jamieson, Leah H.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 20.18.1 - 20.18.4; In English; See also 20060003045

Contract(s)/Grant(s): XR-759; Copyright; Avail.: Other Sources

Some experiments in stop consonant recognition using a new speech analysis technique are presented. The speech analysis technique used a Mellin-Fourier Homomorphism (MFH) on the Fourier transform of initial stop consonant bursts. A template-matching K-nearest neighbor algorithm, with MFH spectra as input, was used in identifying the stops. Extensive experiments using 32 speakers (8 each of male adults, female adults, male children, and female children) and 9 vowel environments were run. Recognition accuracies as high as 85% for voiced stops and 94% for unvoiced stops were achieved without any preliminary voicing decision.

Author

*Homomorphisms; Consonants (Speech); Templates*

**20060003151** Centre National de la Recherche Scientifique, Nancy, France, Institut National de Recherche d'Informatique et d'Automatique, Villers-les-Nancy, France

**Interaction Between Stochastic Modeling and Knowledge-Based Techniques in Acoustic-Phonetic Decoding of Speech**

Haton, Jean-Paul; Carbonell, Noelle; Fohr, Dominique; Mari, Jean-Francois; Kriouille, Abdelaziz; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 868-871; In English; See also 20060003045; Copyright; Avail.: Other Sources

We present in this paper a new approach to acoustic-phonetic decoding of continuous speech that consists of integrating the two most promising present techniques in the field, i.e. stochastic modeling and knowledge-based expert systems. Our group has been developing several systems based on these two techniques during the past 15 years or so. Our present goal is to mix both in order to improve the overall quality of automatic phonetic decoding. This paper is concerned with the first developments of the project. We first present the main characteristics of the components of the system and its general

architecture. We also present and discuss preliminary results concerning the segmentation of the speech wave into phonetic units and the gross labeling of these segments.

Author

*Stochastic Processes; Expert Systems; Decoding; Speech Recognition*

**20060003154** Wisconsin Univ., Madison, WI, USA

#### **Piecewise Uniform Vector Quantizers**

Kuhlmann, Federico; Bucklew, James A.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 912-915; In English; See also 20060003045; Copyright; Avail.: Other Sources

The companding model for quantizer design and analysis has been frequently used in various instances. However, if the signal to be quantized is a vector, then the optimum companding system can be designed for only a limited number of distributions. On the other hand, piecewise linear companders can be designed for any signal density, generating quantizers that are uniform on each region of the compander. These systems, while not optimal, can have performances which are close to the optimum, and their analysis and implementation can be simpler than those of optimal systems. In this paper we analyze piecewise linear companders for asymptotic multidimensional quantization, and we suggest methods for their design.

Author

*Companding; Counters; Vectors (Mathematics)*

**20060003160** University of South Alabama, Mobile, AL, USA

#### **Implementation of Generalized RR Filter Structure Using the Residue Arithmetic**

Krishnan, R.; Jullien, G. A.; Miller, W. C.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 21.7.1 - 21.7.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

Very recently, the Quadratic Residue System (QRNS) has been introduced. Using the QRNS complex multiplication can be performed with two base field multiplication and zero additions. The primary restriction is the limited form of the moduli set for RNS operations. The QRNS has since been generalized for any type of moduli set with an increase in multiplication from 2 to 3 and the resulting number system has been termed Modified Quadratic Residue Number System (MQRNS). A recursive FIR filter has been developed using the Complex Number Theoretic z-transformer (CNT z-transform). Recently, the implementation of this recursive FIR filter structure has been presented using the QRNS and the MQRNS. Extension of this implementation to generalized FIR filter (Lagrange) has also been briefly presented. In this paper, we consolidate the implementation aspects of the generalized FIR filter using the MQRNS and also prove that the QRNS is not a suitable medium for the implementation.

Author

*Arithmetic; Complex Numbers; Fir Filters; Transformers*

**20060003161** Rochester Univ., NY, USA

#### **A Fast Algorithm for the Recursive Design of Linear Phase Filters**

Farden, David C.; Bellegarda, Jerome R.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 916-919; In English; See also 20060003045; Copyright; Avail.: Other Sources

One appropriate technique for the recursive design of linear phase filters is via a minimum mean square error estimation procedure. This paper presents a different parameterization of the problem, which enforces the linear phase structure at all stages of the procedure. The computational complexity of the resulting filter design algorithm is approximately one-half that of existing algorithms, when measured as the overall number of multiplications required. This algorithm in turn leads to a new linear phase realization, simpler than a linear phase lattice/ladder structure and exhibiting better numerical properties than a direct form implementation. The improvement in finite wordlength effects is illustrated by the example design of a lowpass filter.

Author

*Algorithms; Linear Filters; Error Analysis*

**20060003174** Tennessee Univ., Knoxville, TN, USA

#### **Combined Dynamic Data Analysis and Process Variable Prediction Approach for System Fault Detection**

Upadaya, B. R.; Glockler, O.; Wolvaardt, F. P.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 1039-1042; In English; See also 20060003045; Copyright; Avail.: Other Sources

A fault detection approach based on the combination of the Generalized Consistency Check and the Sequential Probability

Ratio Test is developed and applied for validation of signals from process sensors. The basic methodology requires at least triple redundancy of a given measurement from like sensors and analytical measurements. The separate measurement of the signal mean value and the random fluctuation improves the reliability of fault identification and signal reconstruction. The diagnostics of the source of anomaly in a subsystem is performed by multivariate autoregressive modeling of the process signals and the analysis of resulting signatures.

Author

*Data Processing; Signal Processing; Autoregressive Processes*

**20060003180** Texas A&M Univ., College Station, TX, USA

**Experiments on Video Teleconferencing Algorithms at 56 Kilobits/Sec.**

Maragoudakis, Michael; Gibson, Jerry D.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 25.6.1 - 25.6.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

The design of a 56 kilobits/sec. (kbps) coder to transmit monochrome video signals should include several bit rate reduction techniques. In this work, some already existing techniques are simplified and combined with a new edge detection algorithm to produce a simple but efficient coder. Both signal-to-noise ratios and perceptual comparisons indicate that, without loss in performance, significant reduction in transmission data rate can be accomplished by properly recognizing the information bearing parts of an image.

Author

*Algorithms; Coders; Video Conferencing*

**20060003181** Trieste Univ., Italy

**2- and 3-D Nonlinear Predictors**

Ramponi, Giovanni; Sicuranza, Giovanni L.; Cucchi, Silvio; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 25.8.1 - 25.8.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

The performance of both intraframe and interframe quadratic Volterra predictors is considered and compared to that of classical linear operators. A design LMS optimization algorithm is described.

Author

*Algorithms; Nonlinearity; Three Dimensional Models; Predictions; Two Dimensional Models*

**20060003188** California Univ., Los Angeles, CA, USA

**A Fast Prediction Error Detector for Estimating Sparse Spike Sequences**

Giannakis, G. B.; Mendel, J. M.; Zhao, X. F.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 1115-1118; In English; See also 20060003045  
Contract(s)/Grant(s): ECS-8501098; ECS-8602531; Copyright; Avail.: Other Sources

Based on the Maximum-Likelihood principle, we develop a locally optimal method for detecting the location and estimating the amplitude of spikes in a sequence, which are considered the random input of a known ARMA model. A Bernoulli-Gaussian product model is adopted for the sparsespikes sequence, and the available data consist of a single, noisy, output record. By employing a Prediction-Error formulation our iterative algorithm guarantees the increase of a unique likelihood function used for the combined estimation/detection problem. Amplitude estimation is carried out with Kalman smoothing techniques, and event detection is performed in two ways, as an event adder and as an event remover. Synthetic examples verify that our algorithm is self-initialized, consistent, and fast.

Author

*Mathematical Models; Error Detection Codes; Iteration; Algorithms; Sequencing*

**20060003637** Academia Sinica, Canton, China

**A New Iterative Pole Zero Estimator**

Chen, Yan-Yi; Lu, Ji-Ren; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 880-883; In English; See also 20060003631; Copyright; Avail.: Other Sources

A new Iterative Pole-Zero (ARMA) Estimator for finite data length of wide-sense stationary time series is developed and reported in this paper. The new method is compared with the standard MEM, and its performance is much better than MEM. The other advantage is that much lower order of estimate coefficients is needed than with MEM. This parsimony approach inherits the advantage of MEM, and extends effectively MEM from AR area to ARMA area. Both the derivation and the

numerical experiment are described in this paper. The algorithm can be useful in all areas where exact estimate of spectrum is required where exact estimate of spectrum is required.

Author

*Algorithms; Estimating; Time Series Analysis; Coefficients*

**20060003638** University of Southern California, Los Angeles, CA, USA

**Partial Realizations: Existence, Uniqueness and Minimality**

Kung, Sun-Yuan; 1982 International Symposium on Circuits And Systems, Volume 3; [1982]; In English; See also 20060003631

Contract(s)/Grant(s): N00014-81-K-0191; DAAG 29-79-C-0054; NSF ENG-79-08673; Copyright; Avail.: Other Sources

This paper develops some basic rank properties on Hankel matrices which lead to a simple solution to the fundamental questions of the existence, uniqueness, and minimality of partial realization. This result plays a role in systems parametrization which has several applications as illustrated in the example given.

Author

*Uniqueness; Matrices (Mathematics); Existence*

**20060003661** Mons Univ., Belgium

**An Efficient Computation Method For The Bayard-Bode Relations With Applications**

Boite, R.; Leich, H.; Hancq, J.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 872-875; In English; See also 20060003631; Copyright; Avail.: Other Sources

A fast algorithm is proposed for the computation of the BAYARD-BODE relations (HILBERT transformation); instead of using the integral form of those relations, it requires the computation of two F.F.T. of length N. The minimal value of that length to ensure a given accuracy is discussed; applications to continuous and to discrete-time systems are described.

Author

*Algorithms; Computation; Hilbert Transformation*

**20060003662** Tokai Univ., Hiratsuka, Japan

**On a Numerical Solution Of An Integral Equation And Its Inverse Problem**

Tomiyama, Shigenori; Matsuura, Takenobu; Kojima, Norio; Shinozaki, Toshio; Kakukawa, Nobuhiko; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 876-879; In English; See also 20060003631; Copyright; Avail.: Other Sources

this paper, numerical methods for solving the Fredholm integral equation of the second kind and its inverse problem are proposed. The methods employ the approximation technique called the Taylor series method. In these methods, it is assumed that the solutions to be determined can be expressed as a Chebyshev series. By using the Taylor series method the coefficients of the above series are determined so that the residual norm is minimized. And the determination of the initial parameter values to proceed these techniques is presented. Two examples are illustrated.

Author

*Integral Equations; Fredholm Equations; Numerical Analysis; Taylor Series*

**20060003667** California Univ., Los Angeles, CA, USA

**Open-Loop and Closed-Loop Approximations of Linear Systems and Associated Balanced Realizations**

Jonckheere, E.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 919-922; In English; See also 20060003631

Contract(s)/Grant(s): F44620-71-C-0067; DAAG29-79-C-0054; ECS7908673; Copyright; Avail.: Other Sources

Application of the contragredient transformation to any pair of self-adjoint, positive definite operators relevant to the input map and the output map in a linear system yields a myriad of balanced state space realizations and associated model reduction schemes. In this paper, we examine the connections and the gaps between all of these realizations, and show that the model reduction schemes they lead to are not equally relevant to the open-loop and closed-loop cases.

Author

*Approximation; Linear Systems; Transformations (Mathematics)*

**20060003673** Waterloo Univ., Ontario, Canada

**A Decomposition Of A Graph Into Dense Subgraphs**

Toida, S.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 979-980; In English; See also 20060003631; Copyright; Avail.: Other Sources

A density of a graph is defined as the maximum number of disjoint spanning trees of the graph. Using this density an algorithm to find all the subgraphs of a given density of a graph is developed. The decomposition is unique when a density is given. The algorithm is efficient.

Author

*Algorithms; Decomposition; Graphs (Charts)*

**20060003718** Villanova Univ., PA, USA

**Multidimensional Transfer Function Realization Using Linear Systems And Multipliers**

Reddy, Kista P.; Reddy, D. C.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 839-843; In English; See also 20060003631; Copyright; Avail.: Other Sources

It is well known that a non-linear analytic system response can be expressed as the sum of the responses of homogeneous systems of various orders. The use of multi-dimensional transforms in the analysis and synthesis of such non-linear systems is well recognized. In this paper, the problem of realizing a given multidimensional transfer function as the sum of homogeneous systems of various order that are an interconnection of linear systems and multipliers (ILSM) is solved. Given a transfer function, it is first expressed as a sum of multi-variable rational functions each of which corresponds to a homogeneous system of some order. Next these are synthesized as an interconnection of linear systems and multipliers.

Author

*Linear Systems; Multipliers; Transfer Functions*

**20060003720** Roorkee Univ., Roorkee, India

**Strand Product And Its Applications**

Moharir, P. S.; Varma, S. K.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 864-867; In English; See also 20060003631; Copyright; Avail.: Other Sources

There is a great amount of redundancy in a matrix obtained by Kronecker product of component matrices as all the resulting elements are not independent quantities but can be obtained entirely from the knowledge of fewer quantities. The notions of strandmultiplexing and block-multiplexing could be combined in a variety of ways to define newer products of signal flow graphs and incidentally of matrices as well. One of these approaches leads us to the notion of a product called strand product with properties that strand product of circulants is a circulant and of orthonormal kernels is an orthonormal kernel. The circulants have a powerful role in the theory of self-dual codes, construction of Hadamard matrices and by implication, in signal processing.

Author

*Matrices (Mathematics); Signal Flow Graphs; Signal Processing; Strands; Kernel Functions; Redundancy*

**20060003722** Genoa Univ., Genoa, Italy

**Form-invariant Filters and Scaled Transforms**

Braccini, C.; Gambardella, G.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 888-891; In English; See also 20060003631; Copyright; Avail.: Other Sources

A 'form-invariant filter' is a linear shift-variant filter such that, if the input is linearly scaled, the output too undergoes a linear scaling. On the other hand, a 'scaled transform' is a combination of weighting and frequency transformation such that a linear scaling of the input also implies a linear scaling of the output (in the frequency domain). Both form-invariant filters and scaled transforms have been shown to be relevant in pattern recognition. This paper shows that the scaled transforms are the Fourier transforms of the outputs of a subclass of the form-invariant filters. The relevance of this result is discussed.

Author

*Fourier Transformation; Linear Filters; Pattern Recognition*

**20060003728** Ghent Univ., Belgium

**Relations Between Large Finite Horizon And Infinite Horizon LQ-Optimal Control Problems**

Willems, J. L.; Callier, F. M.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 923-926; In English; See also 20060003631; Copyright; Avail.: Other Sources

In this paper, the relations between the finite horizon optimal control problem with receding horizon and the infinite horizon problem are discussed; the system is assumed to be linear, time-invariant, and stabilizable. The cost function is quadratic but the output is the integral of the cost function may be undetectable. Control problems with terminal cost and problems with linear terminal state constraints are dealt with. The solution of the infinite horizon problem as well as the limiting behavior of the solution of the finite horizon problem are reported. A necessary and sufficient condition for equivalence is given; it is satisfied for the standard linear regulator problem.

Author

*Horizon; Linear Quadratic Regulator; Optimal Control*

**20060003736** Katholieke Univ. te Leuven, Belgium

**Modelling of Linear Systems: Critical Examples, Problems and Numerically Reliable Approaches**

Vandewalle, J.; Staar, J.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 915-918; In English; See also 20060003631; Copyright; Avail.: Other Sources

We show that a class of numerical difficulties in circuit analysis and process identification are essentially of a same type, and can all be handled with the singular value decomposition. Algebraically equivalent definite and indefinite model descriptions of electrical circuits are far from being numerically equivalent. Similar: algebraically equivalent implicit or explicit descriptions of algebraic multiports may show quite different numerical qualities. The computation of a state space realization may numerically degenerate if the available degrees of freedom are used to obtain an attractive (canonical), rather than a numerically motivated form. Unified techniques and approaches to obtain optimal representations are discussed. The same numerical tools can also be used to monitor the quality of an input signal in on-line identification of dynamical systems.

Author

*Dynamical Systems; Numerical Analysis; Quality; Linear Systems*

**20060003742** Hiroshima Univ., Japan

**A Heuristic Algorithm For Assigning Multicommodity Flows Of Given Demands Under Strong Integrality Constraints**

Omaga, Kenji; Marumoto, Satoshi; Arimoto, Atsushi; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 989-992; In English; See also 20060003631

Contract(s)/Grant(s): GR-56550252; MOE 00435013; Copyright; Avail.: Other Sources

This paper examines Onaga's necessary and sufficient conditions for realizability of the multicommodity flow demand and proposes a heuristic algorithm of the incremental assignment type where the edge cost is periodically generated according to how many times the edge appears in a set of source-sink bottlenecks and source-sink shortest paths are adopted for connections. A Fortran code of the algorithm was tested on networks of square grids with additional jumper edges. The CPU-time was found proportional to 1.2 power of the number of nodes, and logarithm of the total demand. Accuracy tests by reconstructions of preselected connections was found at a satisfactory level of more than 96V<sub>0</sub>.

Author

*Algorithms; Applications Programs (Computers); Heuristic Methods*

**20060003758** Ohio Univ., Athens, OH, USA

**An Effective Algorithm to the Problem of Two Disjoint Paths with a Minimum Total Weight**

Yong, Sui Fang; Zong, Xuan Hu; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 997-1000; In English; See also 20060003631; Copyright; Avail.: Other Sources

Given an edge-weighted graph  $G=(V,E)$  and four vertices  $s_1, t_1, s_2, t_2$ , the initial problem discussed in this paper is that of determining whether or not there exists two vertex-disjoint paths  $P_1$  and  $P_2$  connect  $s_1$  with  $t_1$  and  $s_2$  with  $t_2$ , respectively, further if at least one such a pair exists, the problem is to find the paths  $P_1$  and  $P_2$  among all such pairs such that  $D(P_1)+D(P_2)$  approaches min, where  $D(P_i)$  ( $i=1,2$ ) is the sum of weights of the edges in  $P_i$ . This problem (STPP in short) is solved by a proposed restricted branch algorithm. By theoretical analysis and experimental examination, the computational times that our algorithm required is estimated at  $O(n^3 \log m)$ , where  $n$ =absolute value of  $V$  and  $m$  is the maximum value of the vertex-degree in  $G$ . As background, several theorems on the shortest paths in a graph are set forth and proved. The algorithm and the verification of the algorithm are then given. A computer program implementing this algorithm has been designed and it can be readily applied to practical use.

Author

*Algorithms; Theorems*

**20060003760** Jordan Univ., Amman, Jordan

**Filters Approximating Ideal Amplitude With Equiripple Phase Characteristics**

Zabalawi, Isam H.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1120-1122; In English; See also 20060003631; Copyright; Avail.: Other Sources

An iterative numerical procedure for the construction of a class of transfer functions exhibiting quasi-equiripple amplitude and equiripple phase characteristics is presented. The ripples in the passband are guaranteed by defining a set of perfect transmission points. The equiripple phase is maintained over the entire passband by varying the positions of the perfect transmission points (interpolation points) in a prescribed manner.

Author

*Numerical Analysis; Transfer Functions*

**20060003761** Research Inst. for Telecommunications, Budapest, Hungary

**New Algorithm For Maximally-Flat, Bandpass Delay Approximations**

Henk, Tamas; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1123-1126; In English; See also 20060003631; Copyright; Avail.: Other Sources

Polynomials are generated by recurrence formula to approximate arbitrary phase or delay functions in the maximally-flat sense at a given frequency different from zero. Due to the maximally-flat nature of the approximation, a new and very compact algorithm can be derived for calculating the coefficients of the polynomial recurrence formula. Discussing the implications of the chosen mid-band phase-shift, the example of the linear-phase bandpass approximation is detailed.

Author

*Algorithms; Phase Shift; Approximation*

**20060003762** Centre National de la Recherche Scientifique, France

**Arbitrary Phase and Group Delay Polynomials**

Jarry, P.; Abdalla, H., Jr.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1117-1119; In English; See also 20060003631; Copyright; Avail.: Other Sources

The closed-form solution is derived for the polynomials which interpolate an arbitrary phase multi-set union ( $\omega$ ) and a given group delay  $\tau(\omega)$  for a finite number of frequencies. The arbitrary phase and group delay polynomials are generated through simple recurrence relations and the conditions of Hurwitz criteria are determined easily. This is a generalization of 'arbitrary phase polynomials' presented in {2} and a particular case of {3}. We can notice that our method is quite different from that presented in {1}. Then the arbitrary phase and group delay polynomials are used to derive the closed-form solution for a transfer function  $S(\omega)$  with an arbitrary phase and group delay and a constant amplitude in the pass-band.

Author

*Polynomials; Equations*

**65**

**STATISTICS AND PROBABILITY**

Includes data sampling and smoothing; Monte Carlo method; time series analysis; and stochastic processes.

**20060003094** Universidad Politecnica de Madrid, Madrid, Spain

**A New Class of High-Order Yule-Walker Estimates**

Vergara-Dominguez, L.; Figueiras-Vidal, A. R.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 1011-1014; In English; See also 20060003045; Copyright; Avail.: Other Sources

We have proposed a new class of HOYW estimates that can be statistically controlled by means of a control variable, which particular value depends on the bias-variance characteristics desired for the final estimate. We have suggested two possible simple alternatives to perform that control, although more elaborated procedures may be also derived. As an intermediate result we have given further analytical justification of the HOYW solution unstable behaviour. Although concentrated on ARMA processes of the AR plus noise type, the results could be probably extended to more general cases. Derived from text

*Estimates; Parameter Identification; Autoregressive Moving Average*

**20060003194** University of Southern California, CA, USA

**Stochastic Relaxation for MAP Restoration of Gray Level Images with Multiplicative Noise**

Jinchi, II; Simchony, T.; Chellappa, R.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 28.16.1 - 28.16.4; In English; See also 20060003045

Contract(s)/Grant(s): NSF DCI-84-51010; Copyright; Avail.: Other Sources

This paper is concerned with developing algorithms for maximum a posteriori (MAP) restoration of gray level images degraded by multiplicative noise. The MAP algorithm requires the probability density function of the original undegraded image which is rarely available and the probability density function of the corrupting noise. By assuming that the original image is represented by a 2-D noncausal Gaussian Markov random field (GMRF) model, the MAP algorithm is written in terms of GMRF model parameters. The computer implementation of the MAP estimator equations is realized by a stochastic relaxation (SR) algorithm. The SR algorithm generates a sequence of images which converges in probability to the global MAP estimate. Several examples of restoration of the gray level image degraded by multiplicative noise are included.

Author

*Stochastic Processes; Algorithms; Imaging Techniques*

**20060003717** Nippon Electric Co. Ltd., Kawasaki, Japan

**A New Average Interconnection Length Prediction Method For Masterslice LSI**

Harada, Norio; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 760-763; In English; See also 20060003631; Copyright; Avail.: Other Sources

In the masterslice LSI physical layout design, knowledge of average interconnection lengths is valuable for wiring space requirement estimation, and wireability analysis. A practical prediction method, based on a new nonlinear equations system, has been developed. This method significantly provides a reasonable approximation of actual average length for well-designed placements. Three similar methods, based on the equation, are considered. The prediction method has been selected from them by comparison between lengths predicted by the methods and lengths of placements designed manually, by using a layout program, or data from other papers.

Author

*Large Scale Integration; Prediction Analysis Techniques; Wiring*

**70**

**PHYSICS (GENERAL)**

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see *categories 71 through 77*. For related instrumentation see *35 Instrumentation and Photography*; for geophysics, astrophysics, or solar physics see *46 Geophysics*, *90 Astrophysics*, or *92 Solar Physics*.

**20060002716** California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

**Exotic physics: search for excited and exotic electrons in the e gamma decay channel in p anti-p collisions at  $s^{1/2} = 1.96$  tev**

Acosta, D.; Adelman, J.; Affolder, T.; Akimoto, T.; Albrow, M. G.; Feb. 2005; 12 pp.; In English  
Report No.(s): DE2005-842915; No Copyright; Avail.: Department of Energy Information Bridge

No abstract available

*Collisions; Electrons; Photons; Transverse Momentum*

**20060002717** California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

**Qcd physics: measurement of the cross section for prompt diphoton production in p anti-p collisions at  $s^{1/2} = 1.96$  tev**

Acosta, D.; Adelman, J.; Affolder, T.; Akimoto, T.; Albrow, M. G.; Jun. 2005; 12 pp.; In English  
Report No.(s): DE2005-842916; No Copyright; Avail.: Department of Energy Information Bridge

We report a measurement of the rate of prompt diphoton production in  $p\bar{p}$  collisions at  $s^{1/2} = 1.96$  TeV using a data sample of 207 pb(sup 1) collected with the upgraded Collider Detector at Fermilab (CDF II). The background from non-prompt sources is determined using a statistical method based on differences in the electromagnetic showers. The cross section is measured as a function of the diphoton mass, the transverse momentum of the diphoton system, and the azimuthal

angle between the two photons and is found to be consistent with perturbative QCD predictions.

NTIS

*Collisions; Quantum Chromodynamics*

**20060002718** Fermi National Accelerator Lab., Batavia, IL, USA

**B physics: First Evidence for  $b \rightarrow s \gamma \phi \phi$  decay and Measurements of Branching Ratio and  $a_{CP}$  for  $b \rightarrow s \gamma \phi \phi$**

Acosta, D.; Apollinari, G.; Griffiths, M.; Khotilovich, V.; Kim, S. H.; May 2005; 12 pp.; In English

Report No.(s): DE2005-842917; No Copyright; Avail.: Department of Energy Information Bridge

No abstract available

*Decay; Particle Accelerators; Branching (Physics)*

**20060002719** California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

**Exotic physics: search for long-lived doubly-charged higgs bosons in  $p$  anti- $p$  collisions at  $\sqrt{s} = 1.96$  tev**

Acosta, D.; Giolo, K.; Goshaw, A. T.; Giunta, M.; Griffiths, M.; January 2005; 18 pp.; In English

Report No.(s): DE2005-842919; No Copyright; Avail.: Department of Energy Information Bridge

No abstract available

*Collisions; Higgs Bosons*

**20060002720** Academia Sinica, Taipei, Taiwan, Province of China, Argonne National Lab., IL USA, Universidad Autonoma de Barcelona, Spain, Bologna Univ., Italy

**Top Physics: Measurement of the Cross Section for  $t\bar{t}$  Production in  $p\bar{p}$  Collisions Using the Kinematics of Lepton + Jets Events**

Acosta, D.; Adelman, J.; Affolder, T.; Akimoto, T.; Albrow, M. G.; January 2005; 50 pp.; In English

Report No.(s): DE2005-842920; No Copyright; Avail.: National Technical Information Service (NTIS)

No abstract available

*Collisions; Leptons; Pair Production*

**20060002721** Academia Sinica, Taipei, Taiwan, Province of China, Argonne National Lab., IL USA, Universidad Autonoma de Barcelona, Bellaterra, Spain, Bologna Univ., Italy

**Exotic Physics: Search for First-Generation Scalar Leptoquarks in  $p\bar{p}$  Collisions at  $\sqrt{s} = 1.96$  tev**

Acosta, D.; Adelman, J.; Affolder, T.; Akimoto, T.; Albrow, M. G.; January 2005; 12 pp.; In English

Report No.(s): DE2005-842921; No Copyright; Avail.: Department of Energy Information Bridge

No abstract available

*Collisions; Pair Production; Scalars*

**20060002722** Academia Sinica, Taipei, Taiwan, Province of China, Argonne National Lab., IL USA, Universidad Autonoma de Barcelona, Bellaterra, Spain, Bologna Univ., Italy

**B Physics: Evidence for the Exclusive Decay  $b \rightarrow c \gamma j/\psi \pi$  and Measurement of the Mass of the  $b \rightarrow c$  Meson**

Acosta, D.; Adelman, J.; Affolder, T.; Akimoto, T.; Albrow, M. G.; May 2005; 14 pp.; In English

Report No.(s): DE2005-842923; No Copyright; Avail.: Department of Energy Information Bridge

No abstract available

*Mesons; Decay*

**20060002723** Fermi National Accelerator Lab., Batavia, IL, USA, Argonne National Lab., IL USA, Universidad Autonoma de Barcelona, Spain, Bologna Univ., Italy

**Top Physics: Measurement of the  $t\bar{t}$  Production Cross Section in  $p\bar{p}$  Collisions at  $\sqrt{s} = 1.96$  tev Using Lepton Plus Jets Events with Semileptonic  $b$  Decays to Muons**

Acosta, D.; Adelman, J.; Affolder, T.; Akimoto, T.; Albrow, M. G.; January 2005; 30 pp.; In English

Report No.(s): DE2005-842924; FERMILAB-PUB-05-220; No Copyright; Avail.: Department of Energy Information Bridge

No abstract available

*Leptons; Muons; Pair Production; Particle Collisions; Particle Decay*

**20060002724** Academia Sinica, Taipei, Taiwan, Province of China, Argonne National Lab., IL USA, Universidad Autonoma de Barcelona, Spain, Bologna Univ., Italy

**Electroweak Physics: Search for  $zz$  and  $zw$  Production in  $p$  Anti- $p$  Collisions at  $s^{1/2} = 1.96$  tev**

May 18, 2005; 12 pp.; In English

Report No.(s): DE2005-842929; No Copyright; Avail.: Department of Energy Information Bridge

No abstract available

*Bosons; Collisions; Electroweak Interactions (Field Theory); Pair Production*

**20060002725** Academia Sinica, Taipei, Taiwan, Province of China, Argonne National Lab., IL USA, Universidad Autonoma de Barcelona, Bellaterra, Spain, Bologna Univ., Italy

**Measurements of the Moments of the Hadronic Invariant Mass Distribution in Semileptonic Beta Decays**

Acosta, D.; Adelman, J.; Affolder, T.; Akimoto, T.; Albrow, M. G.; Mar. 2005; 14 pp.; In English

Report No.(s): DE2005-842931; No Copyright; Avail.: Department of Energy Information Bridge

No abstract available

*Hadrons; Mass Distribution; Particle Decay*

**20060002726** Academia Sinica, Taipei, Taiwan, Province of China, Argonne National Lab., IL USA, Universidad Autonoma de Barcelona, Spain, Bologna Univ., Italy

**B Physics: Measurement of the Lifetime Difference Between  $b$  s Mass Eigenstates**

Apr. 28, 2005; 12 pp.; In English

Report No.(s): DE2005-842932; No Copyright; Avail.: Department of Energy Information Bridge

No abstract available

*Eigenvectors; Decay; Polarization*

**20060002727** Academia Sinica, Taipei, Taiwan, Province of China, Argonne National Lab., IL USA, Universidad Autonoma de Barcelona, Bellaterra, Spain, Bologna Univ., Italy

**Electroweak Physics: Measurement of the Forward-Backward Charge Asymmetry of Electron-Positron Pairs in  $p$  Anti- $p$  Collisions at  $s^{1/2} = 1.96$  tev**

Apr. 25, 2005; 22 pp.; In English

Report No.(s): DE2005-842934; No Copyright; Avail.: Department of Energy Information Bridge

No abstract available

*Asymmetry; Collisions; Electron-Positron Pairs; Electrons; Electroweak Interactions (Field Theory)*

**20060002728** Argonne National Lab., IL USA, Geneva Univ., Geneva, Switzerland, Fermi National Accelerator Lab., Batavia, IL, USA, Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA

**RF Experimental Program in the Fermilab Mucool Test Area**

Norem, J.; Sandstrom, R.; Broos, A.; Moretti, A.; Qian, Z.; January 2005; 8 pp.; In English

Report No.(s): DE2005-843012; No Copyright; Avail.: Department of Energy Information Bridge

The rf R&D program for high gradient, low frequency cavities to be used in muon cooling systems is underway in the Fermilab MUCOOL Test Area. Cavities at 805 and 201 MHz are used for tests of conditioning techniques, surface modification and breakdown studies. This work has the Muon Ionization Cooling Experiment (MICE) as its immediate goal and efficient muon cooling systems for neutrino sources and muon colliders as the long term goal. We study breakdown, and dark current production under a variety of conditions.

NTIS

*Cooling Systems; Radio Frequencies*

**20060002732** Texas Univ., Austin, TX, USA

**Security on the US Fusion Grid**

Burruss, J. R.; Fredian, T. W.; Thompson, M. R.; January 2005; 10 pp.; In English

Report No.(s): DE2005-843070; No Copyright; Avail.: Department of Energy Information Bridge

The National Fusion Collaboratory project is developing and deploying new distributed computing and remote collaboration technologies with the goal of advancing magnetic fusion energy research. This work has led to the development of the US Fusion Grid (FusionGrid), a computational grid composed of collaborative, compute, and data resources from the

three large US fusion research facilities and with users both in the US and in Europe. Critical to the development of FusionGrid was the creation and deployment of technologies to ensure security in a heterogeneous environment. These solutions to the problems of authentication, authorization, data transfer, and secure data storage, as well as the lessons learned during the development of these solutions, may be applied outside of FusionGrid and scale to future computing infrastructures such as those for next-generation devices like ITER.

NTIS

*Nuclear Fusion; Security*

**20060002735** Lawrence Livermore National Lab., Livermore, CA USA

**Multiscale Modeling of Nano-scale Phenomena: Towards a Multiphysics Simulation Capability for Design and Optimization of Sensor Systems**

Lassila, D. H.; McElfresh, M. W.; Rudd, R. E.; Lightstone, F. C.; Balhorn, R. L.; Dec. 03, 2003; 28 pp.; In English  
Report No.(s): DE2005-15013766; UCRL-TR-201247; No Copyright; Avail.: National Technical Information Service (NTIS)

In this white paper, a road map is presented to establish a multiphysics simulation capability for the design and optimization of sensor systems that incorporate nanomaterials and technologies. The Engineering Directorate's solid/fluid mechanics and electromagnetic computer codes will play an important role in both multiscale modeling and integration of required physics issues to achieve a baseline simulation capability. Molecular dynamic simulations performed primarily in the BBRP, CMS and PAT directorates, will provide information for the construction of multiscale models. All of the theoretical developments will require closely coupled experimental work to develop material models and validate simulations. The plan is synergistic and complimentary with the Laboratory's emerging core competency of multiscale modeling. The first application of the multiphysics computer code is the simulation of a 'simple' biological system (protein recognition utilizing synthesized ligands) that has a broad range of applications including detection of biological threats, presymptomatic detection of illnesses, and drug therapy.

NTIS

*Design Optimization; Simulation*

**20060002745** Washington Univ., Seattle, WA, USA

**Active Transport of Nanomaterials Using Motor Proteins. (Final report, Feb 03-Jan 05)**

Hess, H.; January 2005; 8 pp.; In English

Report No.(s): DE2005-842167; No Copyright; Avail.: Department of Energy Information Bridge

During the two year period of funding we have focused on the following topics: Guiding of microtubule movement on kinesin-coated, structured surfaces, directed assembly of oriented microtubule networks, and the interaction between synthetic materials and biological components in hybrid devices based on microtubules and kinesin motors. Additional efforts have been made and are still on-going in controlling the motor activity, and loading and unloading of cargo.

NTIS

*Proteins; Coatings*

**20060002752** Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA

**Direct Laser Synthesis of Functional Coatings**

Schaaf, P.; Shinn, M.; Carpena, E.; Kaspar, J.; Jun. 2005; 14 pp.; In English

Report No.(s): DE2005-842436; No Copyright; Avail.: National Technical Information Service (NTIS)

The direct laser synthesis of functional coatings employs the irradiation of materials with short intensive laser pulses in a reactive atmosphere. The material is heated and plasma is ignited in the reactive atmosphere. This leads to an intensive interaction of the material with the reactive species and a coating is directly formed on the materials surface. By that functional coatings can be easily produced a fast way on steel, aluminium, and silicon by irradiation in nitrogen, methane, or even hydrogen. The influence of the processing parameters to the properties of the functional coatings will be presented for titanium nitride coating produced on titanium with the free electron laser.

NTIS

*Lasers; Coating; Titanium Nitrides*

**20060002764** Duke Univ., Durham, NC, USA, Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA

**Excited D(sub s) (and Pentaquarks) in Chiral Perturbation Theory**

Mehen, T.; Jun. 27, 2005; 14 pp.; In English

Report No.(s): DE2005-841359; No Copyright; Avail.: Department of Energy Information Bridge

The author presents results of a heavy hadron chiral perturbation theory analysis of the decays and masses of the recently discovered excited charm mesons. The present data on the electromagnetic branching ratios are consistent with heavy quark symmetry predictions and disfavor a molecular interpretation of these states. He also discusses model independent predictions for the strong decays of pentaquarks in the 10-bar representation of SU(3) which can be used to constrain the angular momentum and parity quantum numbers of these states.

NTIS

*Chirality; Perturbation Theory; Quarks; Symmetry*

**20060002767** Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA

**Status of Pentaquark Search at Jlab**

Kubarovsky, V.; Stoler, P.; Oct. 2004; 14 pp.; In English

Report No.(s): DE2005-841678; No Copyright; Avail.: National Technical Information Service (NTIS)

We review the current experimental situation of pentaquark searches, and second generation experiments, with emphasis on the Jefferson Lab program.

NTIS

*Research and Development; Quantum Chromodynamics*

**20060002774** Texas Univ., Austin, TX, USA

**State Selective Dynamics of Molecules, Clusters, and Nanostructures. (Final Report, May 1, 1993-February 29, 2005.)**

Keto, J. W.; January 2005; 74 pp.; In English

Report No.(s): DE2005-841735; DOE/ER-14348-10; No Copyright; Avail.: National Technical Information Service (NTIS)

The objective of this grant has been the study of state-to-state, electronic energy transfer reactions relevant to the excited state chemistry observed in a variety of environments- mixed gases, supersonic jets, discharges, and in condensed matter. The reactant states are excited selectively by one or two-photon transitions driven by a tunable u.v. lasers. Product channels are observed by their fluorescence, or by laser induced fluorescence using a second color laser, or by Raman transitions observed by coherent two-color four wave mixing. An earlier grant explored excitation transfer reactions in rare gases and rare gases doped with chorides. These reactions were important to both excimer lasers and the nuclear pumped rare gas laser. More recent experiments have studied laser assisted reactive scattering, energy transfer in condensed rare gases and in clusters formed in supersonic jets. Toward the end of the grant we developed a technique for the manufacture of nanoparticles: Laser Ablation of Microparticles (LAM) in flowing aerosols. We have used state selective laser spectroscopy to study clusters and nanoparticles produced by this method.

NTIS

*Clusters; Energy Transfer; Excitation; Molecules; Nanostructures (Devices)*

**20060002775** California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

**Studies of Reaction Kinetics of Methane Hydrate Dissociation in Porous Media**

Moridis, G. J.; Seol, Y.; Kneafsey, T. J.; January 2005; 14 pp.; In English

Report No.(s): DE2005-842696; No Copyright; Avail.: Department of Energy Information Bridge

The objective of this study is the description of the kinetic dissociation of CH(sub 4)-hydrates in porous media, and the determination of the corresponding kinetic parameters. Knowledge of the kinetic dissociation behavior of hydrates can play a critical role in the evaluation of gas production potential of gas hydrate accumulations in geologic media. We analyzed data from a sequence of tests of CH(sub 4)-hydrate dissociation by means of thermal stimulation. These tests had been conducted on sand cores partially saturated with water, hydrate and CH(sub 4) gas, and contained in an x-ray-transparent aluminum pressure vessel. The pressure, volume of released gas, and temperature (at several locations within the cores) were measured. To avoid misinterpreting local changes as global processes, x-ray computed tomography scans provided accurate images of the location and movement of the reaction interface during the course of the experiments. Analysis of the data by means of inverse modeling (history matching) provided estimates of the thermal properties and of the kinetic parameters of the hydration reaction in porous media. Comparison of the results from the hydrate-bearing porous media cores to those from pure CH(sub 4)-hydrate samples provided a measure of the effect of the porous medium on the kinetic reaction. A tentative model of composite thermal conductivity of hydrate-bearing media was also developed.

NTIS

*Hydrates; Kinetics; Porosity; Reaction Kinetics*

**20060002791** Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA

**Spin and Azimuthal Asymmetries at JLAB**

Avakian, H.; Jun. 2005; 46 pp.; In English

Report No.(s): DE2005-841870; No Copyright; Avail.: National Technical Information Service (NTIS)

No abstract available

*Asymmetry; Azimuth*

**20060002795** Brookhaven National Lab., Upton, NY USA, Rutgers - The State Univ., New Brunswick, NJ, USA

**Plans of Transverse Target SSA Measurements in SIDIS at Jefferson Lab Hall A and Hall C**

Jiang, X.; Jun. 2005; 32 pp.; In English

Report No.(s): DE2005-841871; No Copyright; Avail.: National Technical Information Service (NTIS)

With a relatively high luminosity available for xed target experiments at Jefferson Lab's Hall A and Hall C, transversely polarized target single-spin asymmetry measurements in SIDIS reactions will become a reality in the next few years.

NTIS

*Asymmetry; Linear Accelerators; Targets*

**20060002818** Lawrence Livermore National Lab., Livermore, CA USA

**Shielding a Streak Camera from Hard X-rays**

Schneider, M. B.; Sorce, C.; Loughman, K.; Emig, J.; Bruns, H. C.; Apr. 16, 2004; 32 pp.; In English

Report No.(s): DE2005-15014095; UCRL-CONF-203605; No Copyright; Avail.: National Technical Information Service (NTIS)

The targets used in the Hot Halfraum Campaign at OMEGA create many hot electrons, which result in a large flux of hard x-rays. The hard x-rays produce a high background in the streak camera. The background was significantly reduced by wrapping the streak camera with a high-Z material; in this case, 1/8 inches of Pb. The large hard x-ray flux also adds noise to images from framing cameras which use CCDs.

NTIS

*Hot Electrons; Shielding; Streak Cameras; X Rays*

**20060002819** Lawrence Livermore National Lab., Livermore, CA USA

**X-Ray Line Measurements with High Efficiency Bragg Crystals**

Pak, A.; Gregori, G.; Knight, J.; Campbell, K.; Landen, O. L.; Apr. 26, 2004; 14 pp.; In English

Report No.(s): DE2005-15014110; UCRL-CONF-203748; No Copyright; Avail.: Department of Energy Information Bridge

No abstract available

*Bragg Angle; Crystals; X Ray Diffraction; X Rays*

**20060002821**

**Particle-in-Cell Simulations of Lower-Density CM-Scale Capillary Channels**

Messmer, P.; Bruhwiler, D.; Dimitrov, D.; Stoltz, P.; January 2005; 8 pp.; In English

Report No.(s): DE2005-843148; No Copyright; Avail.: Department of Energy Information Bridge

Capillary channels of cm-length and at plasma density low compared to gas jets are promising setups for low noise laser wakefield acceleration. Computationally, however, the large discrepancy of the length scales of the plasma and the laser are a big challenge. Methods are therefore sought that relax the need to concurrently resolve both length scales. Average methods, which split the electromagnetic field into a fast and a slowly varying part, allow to relax the constraint to resolve the laser wavelength. Such an envelope model is currently being incorporated into the VORPAL plasma simulation code. Simulation results for benchmark cases and for laser pulse propagation in a cm-scale channel are presented.

NTIS

*Simulation; Computerized Simulation; Capillary Flow*

**20060002822** Lawrence Livermore National Lab., Livermore, CA, USA

**Investigation of the Influence of Initial Conditions on Rayleigh-Taylor Mixing**

Mueschke, N. J.; Schilling, O.; Nov. 22, 2004; 130 pp.; In English

Report No.(s): DE2005-15011786; UCRL-TH-208163; No Copyright; Avail.: National Technical Information Service (NTIS)

Experiments and direct numerical simulations (DNS) have been performed to examine the effects of initial conditions on

the dynamics of a Rayleigh-Taylor unstable mixing layer. Experiments were performed on a water channel facility to measure the interfacial and velocity perturbations initially present at the two-fluid interface in a small Atwood number mixing layer. The experimental measurements have been parameterized for use in numerical simulations of the experiment. Two- and three-dimensional DNS of the experiment have been performed using the parameterized initial conditions. It is shown that simulations implemented with initial velocity and density perturbations, rather than density perturbations alone, are required to match experimentally-measured statistics and spectra. Data acquired from both the experiment and numerical simulations are used to examine the role of initial conditions on the evolution of integral-scale, turbulence, and mixing statistics. Early-time turbulence and mixing statistics are shown to be strongly-dependent upon the early-time transition of the initial perturbation from a weakly-nonlinear to a strongly-nonlinear flow.

NTIS

*Taylor Instability; Mixing Layers (Fluids); Direct Numerical Simulation; Perturbation*

**20060002823** Lawrence Livermore National Lab., Livermore, CA USA

**Applicability of the Spin-Orbit Sum Rule for the Actinide 5f States**

van der Laan, G.; Moore, K. T.; Tobin, J. G.; Feb. 20, 2004; 20 pp.; In English

Report No.(s): DE2005-15013862; UCRL-TR-202444; No Copyright; Avail.: Department of Energy Information Bridge

The branching ratio of core-valence transitions in x-ray absorption spectroscopy and electron energy loss spectroscopy is linearly related to the expectation value of the spin-orbit operator of the valence states. Here, we analyze the measured branching ratio of the N<sub>9</sub>(sub 4, 5) edges acquired by electron energy-loss spectroscopy in a transmission electron microscope, and synchrotron-radiation-based x-ray absorption. Results show that the spin-orbit sum rule can be applied to actinide 5f states, where the accuracy can be increased using the correction term obtained from atomic many-electron calculations.

NTIS

*Sum Rules; Branching (Physics); X Ray Absorption; Electron Spectroscopy*

**20060002832** Brookhaven National Lab., Upton, NY USA

**Classical and Quantum Aspects of the Color Glass Condensate**

Kharzeev, D.; Stasto, A.; Tuchin, K.; Vogelsang, W.; January 2005; 142 pp.; In English

Report No.(s): DE2005-15015156; BNL-73793; No Copyright; Avail.: Department of Energy Information Bridge

This aim of this workshop was to bring together experts in the field to study and discuss the Color Glass Condensate theory and related topics.

NTIS

*Color; Condensates; Glass*

**20060002840** Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA, Adelaide Univ., Australia

**Hadron Structure on the Back of an Envelope**

Thomas, A. W.; Young, R. D.; Leinweber, D. B.; January 2005; 14 pp.; In English

Report No.(s): DE2005-850111; No Copyright; Avail.: Department of Energy Information Bridge

In order to remove a little of the mysticism surrounding the issue of strangeness in the nucleon, we present simple, physically transparent estimates of both the strange magnetic moment and charge radius of the proton. Although simple, the estimates are in quite good agreement with sophisticated calculations using the latest input from lattice QCD. We further explore the possible size of systematic uncertainties associated with charge symmetry violation (CSV) in the recent precise determination of the strange magnetic moment of the proton. We find that CSV acts to increase the error estimate by 0.003  $\mu$ (sub N) such that  $G$ (sub M)(sup 8) = -0.046 (+-) 0.022  $\mu$ (sub N).

NTIS

*Hadrons; Magnetic Moments; Strangeness; Error Analysis; Nucleons*

**20060002876** Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA

**Beyond an Electronic Logbook**

Larrieu, T.; McGuckin, T.; January 2005; 8 pp.; In English

Report No.(s): DE2005-838351; No Copyright; Avail.: National Technical Information Service (NTIS)

The advantages of an electronic logbook over a paper logbook have been well-established by presenters at various conferences: multiple simultaneous access, readily attached supporting documentation, easy searchability. At Jefferson Lab, we view these benefits as a start rather than an end. Instead of a being a static repository for operational history, the electronic

logbook should actively inform machine operations. We take advantage of a decision early in development to make our operational problem reporting system integral to the electronic logbook. Log entries requiring attention of system experts are dispatched directly from within the logbook. And more importantly, the follow-up and resolution of those same problems is also captured in the electronic logbook. The interface for making log entries is being extended to query the logbook database immediately when a new problem report is initiated and to search for similar resolved entries in the past. If close matches are found, they are presented to the person making a new entry. We hope that in many cases, this readily-accessible display of prior resolutions will allow the entry maker to solve many problems on-the spot and obviate the need to dispatch the problem to a system expert.

NTIS

*Data Bases; Multiple Access*

**20060002878** Hampton Univ., VA, USA, Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA

**Baryons in the  $1/N_c$  Expansion**

Goity, J. L.; January 2005; 14 pp.; In English

Report No.(s): DE2005-838469; No Copyright; Avail.: Department of Energy Information Bridge

A brief overview of the  $1/N_c$  expansion in the baryon sector is given, with emphasis on recent analyses of masses and decays of excited baryons.

NTIS

*Baryons; Cold Neutrons*

**20060002879** Rice Univ., Houston, TX, USA

**Novel Nanowires as Probes of Electron Coherence and Correlations in Restricted geometries (DE-FG03-01ER45946)**

Natelson, D.; May 17, 2005; 18 pp.; In English

Report No.(s): DE2005-840112; No Copyright; Avail.: National Technical Information Service (NTIS)

This is a final summary report of the research conducted under DE-FG03-01ER45946, which was a research program using metal nanostructures to examine quantum coherence of electrons in normal and ferromagnetic metals. This program was the PI's first federal research grant, and by augmenting with other funds (Packard Foundation), this grant supported two graduate students during its duration. In normal metal nanostructures, quantum coherence was assessed by two independent techniques: weak localization magnetoresistance, and time-dependent universal conductance fluctuations (TDUCF noise). This work found that, in AuPd nanowires, the coherence information inferred from these two techniques were quantitatively consistent, even in the presence of magnetic impurity and phonon scattering. This confirmed theoretical expectations. However, in Ag and Au wires, the two techniques disagree, with noise measurements indicating a lower coherence length at low temperatures than weak localization.

NTIS

*Correlation; Electrons; Nanowires*

**20060002898** Fermi National Accelerator Lab., Batavia, IL, USA

**Testing the CDF Distributed Computing Framework**

Bartshc, V.; Baranovski, A.; Belforte, S.; Burgon-Lyon, M.; January 2005; 6 pp.; In English

Report No.(s): DE2005-15016951; FERMILAB-CONF-04-492; No Copyright; Avail.: National Technical Information Service (NTIS)

A major source of CPU power for CDF (Collider Detector at Fermilab) is the CAF (Central Analysis Farm) at Fermilab. The CAF is a farm of computers running Linux with access to the CDF data handling system and databases to allow CDF collaborators to run batch analysis jobs. Beside providing CPU power it has a good monitoring tool. The CAF software is a wrapper around a batch system, either fbsng or condor, to submit jobs in a uniform way. So the submission to the CAF clusters inside and outside Fermilab from many computers with kerberos authentication is possible. It is mainly used to access datasets which comprise a large amount of files and analyze the data. Up to now the DCache system has been used to access the files. In autumn 2004 some of the important datasets will only be readable with the help of the data handling system SAM (Sequential Access to data via Metadata). This will be done in order to switch to using only one data handling system at Fermilab and on the remote sites. SAM has been used in run II to store, manage, deliver and track the processing of all data. It is designed to copy data to remote sites with remote analysis in mind.

NTIS

*Central Processing Units; Detectors*

**20060002906** Brookhaven National Lab., Upton, NY USA

**OCD Factorization for Semi-Inclusive Deep Inelastic Scattering**

Yuan, F.; January 2005; 10 pp.; In English

Report No.(s): DE2005-15016541; BNL-74704; No Copyright; Avail.: Department of Energy Information Bridge

In this talk, we will present a QCD factorization theorem for the semi-inclusive deep-inelastic scattering with hadrons in the current fragmentation region detected at low transverse momentum.

NTIS

*Factorization; Inelastic Scattering; Quantum Chromodynamics*

**20060002909** Brookhaven National Lab., Upton, NY USA

**Fluctuation Results from PHENIX**

Mitchell, J.T.; Apr. 2005; 16 pp.; In English

Report No.(s): DE2005-15016745; BNL-74791-2005-CP; No Copyright; Avail.: National Technical Information Service (NTIS)

The PHENIX Experiment at the Relativistic Heavy Ion Collider has made measurements of event-by-event fluctuations in the net charge, the mean transverse momentum, and the charged particle multiplicity as a function of collision energy, centrality, and transverse momentum in heavy ion collisions. The results of these measurements will be reviewed and discussed.

NTIS

*Charged Particles; Variations*

**20060002912** Fermi National Accelerator Lab., Batavia, IL, USA

**Tevatron HTS Power Lead Test**

Feher, S.; Caragno, R.; Orris, D.; Pischalnikov, Y.; January 2005; 8 pp.; In English

Report No.(s): DE2005-15016935; FERMILAB-CONF-04-257; No Copyright; Avail.: National Technical Information Service (NTIS)

Two pairs of ASC 6 kA power leads developed for the Tevatron were successfully tested at Fermilab at over-current conditions. Stable operation was achieved while operating at a current of 9.56 kA for five hours and while continuously ramping between 0-9.56 kA at a ramp rate of 200 A/s for one hour. The minimum required liquid nitrogen flow rate was measured to be 1.5 g/s at 10 kA. After ramping up to 10 kA at 200A/s, it took only 15 minutes to stabilize the upper copper section of the lead with a flow of 1.8 g/s of liquid nitrogen vapor. Testing under extreme operating conditions--270-370 kPa liquid nitrogen vapor pressure and over 0.1 T external magnetic field--demonstrated that the HTS part of the lead can safely operate in the current sharing mode and that this design has large operating margin.

NTIS

*Particle Accelerators; Superconductivity*

**20060002913** Fermi National Accelerator Lab., Batavia, IL, USA

**Test Result of LHC Interaction Regions Quadrupoles Produced by Fermilab**

Bossert, R.; Carson, J.; Chichili, D. R.; Feher, S.; Kerby, J.; January 2005; 8 pp.; In English

Report No.(s): DE2005-15016936; FERMILAB-CONF-04-255; No Copyright; Avail.: National Technical Information Service (NTIS)

The US-LHC Accelerator Project is responsible for the production of the Q2 optical elements of the final focus triplets in the LHC interaction regions. As part of this program Fermilab is in the process of manufacturing and testing cryostat assemblies (LQXB) containing two identical quadrupoles (MQXB) with a dipole corrector between them. The 5.5 m long Fermilab designed MQXB have a 70 mm aperture and operate in superfluid helium at 1.9 K with a peak field gradient of 215 T/m. This paper summarizes the test results of several production MQXB quadrupoles with emphasis on quench performance and alignment studies. Quench localization studies using quench antenna signals are also presented.

NTIS

*Quadrupoles; Accelerators*

**20060002914** Fermi National Accelerator Lab., Batavia, IL, USA

**Virtual Organization Membership Service Extension Project (VOX)**

Levshina, T.; Baudrick, L.; Berman, E.; Fisk, I.; Graham, G.; January 2005; 8 pp.; In English

Report No.(s): DE2005-15016938; FERMILAB-CONF-04-475; No Copyright; Avail.: National Technical Information Service (NTIS)

Current grid development projects are being designed such that they require end users to be authenticated under the auspices of a 'recognized' organization, called a Virtual Organization (VO). A VO must establish resource-usage agreements with grid resource providers. The VO is responsible for authorizing its members for grid computing privileges. The individual sites and resources typically enforce additional layers of authorization. The VOX project developed at Fermilab is an extension of VOMS, developed jointly for DataTAG by INFN and for DataGrid by CERN. The VOX project provides set of services that facilitate grid users registration with a VO, administration of VO members, as well as control access of grid users to a particular site. The current state of deployment and future steps to improve the prototype and implement some new features will be discussed.

NTIS

*Virtual Reality; Project Management*

**20060002915** Fermi National Accelerator Lab., Batavia, IL, USA, Glasgow Univ., UK, Karlsruhe Univ., Germany, Rutgers - The State Univ., Piscataway, NJ, USA

**Tools for Grid Deployment of CDF Offline and SAM Data Handling Systems for Summer 2004 Computing**

Kreymer, A.; Baranoski, A.; Garzoglio, G.; Herber, R.; January 2005; 10 pp.; In English

Report No.(s): DE2005-15016940; FERMILAB-CONF-04-478; No Copyright; Avail.: National Technical Information Service (NTIS)

The Fermilab CDF Run-II experiment is now providing official support for remote computing, which has provided approximately 35% of the total CDF computing capacity during the summer of 2004. We face the challenge of unreliable networks, time differences, and remote managers having little experience with this particular software. The approach we have taken has been to separate the data handling components from the main CDF offline code releases by means of shared libraries, permitting live upgrades to otherwise frozen code. We now use a special 'development lite' release to ensure that all sites have the latest tools available. We have put substantial effort into revision control, so that essentially all active CDF sites are running exactly the same SAM code.

NTIS

*Data Systems; Deployment; Summer*

**20060002916** Fermi National Accelerator Lab., Batavia, IL, USA

**Status and Performance of the CDF Run 2 Silicon Detectors**

Nielsen, J.; January 2005; 10 pp.; In English

Report No.(s): DE2005-15016941; FERMILAB-CONF-04-423; No Copyright; Avail.: National Technical Information Service (NTIS)

In 2001, an upgraded silicon detector system was installed in the CDF II experiment on the Tevatron at Fermilab. The complete system consists of three silicon microstrip detectors: SVX II with five layers for precision tracking, Layer 00 with one beampipe-mounted layer for vertexing, and two Intermediate Silicon Layers located between SVX II and the main CDF II tracking chamber. Currently all detectors in the system are operating at or near design levels. The performance of the combined silicon system is excellent in the context of CDF tracking algorithms, and the first useful physics results from the innermost Layer 00 detector have been recently documented. Operational and monitoring efforts have also been strengthened to maintain silicon efficiency through the end of Run 2 at the Tevatron.

NTIS

*Silicon; Detectors*

**20060002917** Fermi National Accelerator Lab., Batavia, IL, USA

**Status of the Fermilab Data Storage System**

Bakken, J.; Berman, E.; Huang, C. H.; Moibenko, A.; January 2005; 8 pp.; In English

Report No.(s): DE2005-15016939; FERMILAB-CONF-04-483; No Copyright; Avail.: National Technical Information Service (NTIS)

This document describes the Fermilab Data Storage System Enstore, its design concepts, structure, and current status. Enstore provides storage of the data in robotic tape libraries according to requirements of the experiments. High fault tolerance and availability, as well as multilevel priority based request processing allows experiments to effectively store and access data in the Enstore. Amount of data stored in the system currently approaches 2 PBytes. The Enstore system includes 5 robotic tape libraries, more than 100 PC nodes, and 90 tape drives. The distributed structure and modularity of Enstore allows scaling of the system and adding of more storage equipment as the requirements and needs grow. Users access data in Enstore directly

using a special command. They can also use ftp, GridFtp, and SRM interfaces to the dCache caching and buffering system, which uses Enstore as its lower layer storage.

NTIS

*Data Storage; Accelerators*

**20060002918** Fermi National Accelerator Lab., Batavia, IL, USA

**CLHEP Infrastructure Improvements**

Garren, L.; January 2005; 8 pp.; In English

Report No.(s): DE2005-15016942; FERMILAB-CONF-04-453; No Copyright; Avail.: Department of Energy Information Bridge

CLHEP is a set of HEP-specific foundation and utility classes such as random number generators, physics vectors, and particle data tables. Although CLHEP has traditionally been distributed as one large library, the user community has long wanted the ability to build and use CLHEP packages separately. With the release of CLHEP 1.9, CLHEP has been reorganized and enhanced to enable building and using CLHEP packages individually as well as collectively. The revised build strategy employs all the components of the standard autotools suite: automake, autoconf, and libtool. In combination with the reorganization, the use of these components makes it easy not only to rebuild any single package (e.g., when that package changes), but also to add new packages.

NTIS

*High Energy Interactions; Physics*

**20060002925** Fermi National Accelerator Lab., Batavia, IL, USA

**Autoblocker: A System for Detecting and Blocking of Network Scanning Based on Analysis of Netflow Data**

Bobyshev, A.; Lamore, D.; Demar, P.; January 2005; 8 pp.; In English

Report No.(s): DE2005-15016945; FERMILAB-CONF-04-487; No Copyright; Avail.: National Technical Information Service (NTIS)

In a large campus network, such at Fermilab, with tens of thousands of nodes, scanning initiated from either outside of or within the campus network raises security concerns. This scanning may have very serious impact on network performance, and even disrupt normal operation of many services. In this paper we introduce a system for detecting and automatic blocking excessive traffic of different kinds of scanning, DoS attacks, virus infected computers. The system, called AutoBlocker, is a distributed computing system based on quasi-real time analysis of network flow data collected from the border router and core switches. AutoBlocker also has an interface to accept alerts from IDS systems (e.g. BRO, SNORT) that are based on other technologies. The system has multiple configurable alert levels for the detection of anomalous behavior and configurable trigger criteria for automated blocking of scans at the core or border routers. It has been in use at Fermilab for about 2 years, and has become a very valuable tool to curtail scan activity within the Fermilab campus network.

NTIS

*Blocking; Detection; Network Analysis*

**20060002926** California Univ., Berkeley, CA USA

**Measurement of the Production Cross Section of Top-Antitop Pairs in Proton-Antiproton Collisions at a Center of Mass of 1.96 TeV Using Secondary Vertex b-Tagging**

Bachacou, H.; January 2004; 236 pp.; In English

Report No.(s): DE2005-15016943; No Copyright; Avail.: National Technical Information Service (NTIS)

This thesis presents a measurement of the  $t(\bar{t})$  production cross section at CDF using the 162 pb(sup -1) of data taken at the Tevatron between February 2002 and September 2003. It is organized as follows: Chapter 2 is a brief introduction to quantum field theory, the Standard Model, and top quark physics, as well as an overview of the analysis, and the motivation for it. Chapter 3 describes the experimental setup: the chain of accelerators, the Tevatron collider, and the Collider Detector at Fermilab (CDF). Chapter 4 describes the event reconstruction, the data samples, and the event selection. Chapter 5 goes into the details of the secondary vertex b-tagging algorithm. Chapter 6 describes the measurement of the b-tagging algorithm efficiency and fake rate. Chapter 7 describes the estimation of the heavy flavor composition of the W + Jets sample, necessary to understand the background due to W + Heavy Flavor production. Chapter 8 describes the estimate of the various backgrounds. Chapter 10 shows Z(sup 0) + Jets and W + Jets data samples used for this analysis and gives the result of the

measurement. Chapter 11 discusses the result and concludes on the prospects of top quark physics.

NTIS

*Center of Mass; Marking; Particle Collisions; Proton-Antiproton Interactions*

**20060002927** Fermi National Accelerator Lab., Batavia, IL, USA

**Building Global HEP Systems on Kerberos**

Crawford, M.; January 2005; 8 pp.; In English

Report No.(s): DE2005-15016946; FERMILAB-CONF-04-491; No Copyright; Avail.: Department of Energy Information Bridge

As an underpinning of AFS and Windows 2000, and as a formally proven security protocol in its own right, Kerberos is ubiquitous among HEP sites. Fermilab and users from other sites have taken advantage of this and built a diversity of distributed applications over Kerberos v5. We present several projects in which this security infrastructure has been leveraged to meet the requirements of geographically dispersed collaborations. These range from straightforward 'Kerberization' of applications such as database and batch services, to quick tricks like simulating a user-authenticated web service with AFS and the 'file': schema, to more complex systems. Examples of the latter include experiment control room operations and the Central Analysis Farm (CAF). We present several use cases and their security models, and examine how they attempt to address some of the outstanding problems of secure distributed computing: delegation of the least necessary privilege; establishment of trust between a user and a remote processing facility; credentials for long-queued or long-running processes, and automated processes running without any user's presence; security of remotely-stored credentials; and ability to scale to the numbers of sites, machines and users expected in the collaborations of the coming decade.

NTIS

*High Energy Interactions; Physics*

**20060002928** Fermi National Accelerator Lab., Batavia, IL, USA

**Monitoring a Petabyte Scale Storage System**

Bakken, J.; Berman, E.; Huang, C. H.; Moibenko, A.; January 2005; 8 pp.; In English

Report No.(s): DE2005-15016947; FERMILAB-CONF-04-493; No Copyright; Avail.: National Technical Information Service (NTIS)

Fermilab operates a petabyte scale storage system, Enstore, which is the primary data store for experiments' large data sets. The Enstore system regularly transfers greater than 15 Terabytes of data each day. It is designed using a client-server architecture providing sufficient modularity to allow easy addition and replacement of hardware and software components. Monitoring of this system is essential to insure the integrity of the data that is stored in it and to maintain the high volume access that this system supports. The monitoring of this distributed system is accomplished using a variety of tools and techniques that present information for use by a variety of roles (operator, storage system administrator, storage software developer, user). Essential elements of the system are monitored: performance, hardware, firmware, software, network, data integrity. We will present details of the deployed monitoring tools with an emphasis on the different techniques that have proved useful to each role. Experience with the monitoring tools and techniques, what worked and what did not will be presented.

NTIS

*Data Storage; Monitors*

**20060002931** Fermi National Accelerator Lab., Batavia, IL, USA

**Storage Resource Manager**

Perelmutov, T.; Bakken, J.; Petravick, D.; January 2005; 8 pp.; In English

Report No.(s): DE2005-15016944; FERMILAB-CONF-04-473; No Copyright; Avail.: National Technical Information Service (NTIS)

Storage Resource Managers (SRMs) are middleware components whose function is to provide dynamic space allocation and file management on shared storage components on the Grid. SRMs support protocol negotiation and reliable replication mechanism. The SRM standard supports independent SRM implementations, allowing for a uniform access to heterogeneous storage elements. SRMs allow site-specific policies at each location. Resource Reservations made through SRMs have limited lifetimes and allow for automatic collection of unused resources thus preventing clogging of storage systems with 'orphan' files. At Fermilab, data handling systems use the SRM management interface to the dCache Distributed Disk Cache and the Enstore Tape Storage System as key components to satisfy current and future user requests. The SAM project offers the SRM

interface for its internal caches as well. The Storage Resource Manager specification is a result of international collaborative effort by representatives of JLAB, LBNL, FNAL, EDG-WP2 and EDG-WP5.

NTIS

*Data Storage; Accelerators*

**20060002932** Fermi National Accelerator Lab., Batavia, IL, USA

**Lattice QCD Clusters at Fermilab**

Holmgren, D.; January 2005; 8 pp.; In English

Report No.(s): DE2005-15016948; FERMILAB-CONF-04-484; No Copyright; Avail.: National Technical Information Service (NTIS)

As part of the DOE SciDAC 'National Infrastructure for Lattice Gauge Computing' project, Fermilab builds and operates production clusters for lattice QCD simulations. This paper will describe these clusters. The design of lattice QCD clusters requires careful attention to balancing memory bandwidth, floating point throughput, and network performance. We will discuss our investigations of various commodity processors, including Pentium 4E, Xeon, Opteron, and PPC970. We will also discuss our early experiences with the emerging Infiniband and PCI Express architectures. Finally, we will present our predictions and plans for future clusters.

NTIS

*Quantum Chromodynamics; Accelerators*

**20060002936** Deutsches Elektronen-Synchrotron, Hamburg, Germany

**Experience Producing Simulated Events for the Dzero Experiment on the Sam-Grid**

Garzoglio, G.; Terekhov, I.; Snow, J.; January 2005; 1 pp.; In English

Report No.(s): DE2005-15016950; FERMILAB-CONF-04-480; No Copyright; Avail.: National Technical Information Service (NTIS)

Most of the simulated events for the DZero experiment at Fermilab have been historically produced by the 'remote' collaborating institutions. One of the principal challenges reported concerns the maintenance of the local software infrastructure, which is generally different from site to site. As the understanding of the distributed computing community over distributively owned and shared resources progresses, the adoption of grid technologies to address the production of Monte Carlo events for high energy physics experiments becomes increasingly interesting. SAM-Grid is a software system developed at Fermilab, which integrates standard grid technologies for job and information management with SAM, the data handling system of the DZero and CDF experiments.

NTIS

*Detectors; Simulation*

**20060002939** Fermi National Accelerator Lab., Batavia, IL, USA

**Improving Standard C++ for the Physics**

Paterno, M.; Brown, W. E.; January 2005; 10 pp.; In English

Report No.(s): DE2005-15016949; FERMILAB-CONF-04-485; No Copyright; Avail.: Department of Energy Information Bridge

As Fermilab's representatives to the C++ standardization effort, we have been promoting directions of special interest to the physics community. We here report on selected recent developments toward the next revision, informally denoted C++0x, of the C++ Standard.

NTIS

*C++ (Programming Language); Physics*

**20060002960** Lawrence Livermore National Lab., Livermore, CA USA

**Theoretical Studies of Excitation in Low-Energy Electron-Polyatomic Molecule Collisions**

Rescigno, T. N.; McCurdy, C. W.; Isaacs, W. A.; Orel, A. E.; Meyer, H. D.; Aug. 13, 2001; 18 pp.; In English

Report No.(s): DE2005-15013417; UCRL-JC-145447; No Copyright; Avail.: National Technical Information Service (NTIS)

This paper focuses on the channeling of energy from electronic to nuclear degrees of freedom in electron-polyatomic molecule collisions. We examine the feasibility of attacking the full scattering problem, both the fixed-nuclei electronic problem and the post-collision nuclear dynamics, entirely from first principles. The electron CO<sub>2</sub> system is presented as an example. We study resonant vibrational excitation, showing how ab initio, fixed-nuclei electronic cross sections can provide

the necessary input for a multi-dimensional treatment of the nuclear vibrational dynamics.

NTIS

*Electron Scattering; Excitation; Molecular Collisions; Polyatomic Molecules*

**20060003022** Lawrence Livermore National Lab., Livermore, CA USA

**Cost Estimate for Laser Isotope Separation for RIA**

Scheibner, K.; Nov. 05, 2004; 14 pp.; In English

Report No.(s): DE2005-15014826; UCRL-TR-207759; No Copyright; Avail.: National Technical Information Service (NTIS)

Isotope enrichment of some elements is required in support of the Rare Isotope Accelerator (RIA) in order to obtain the beam intensities, source efficiencies and/or source lifetime required by RIA. The economics of using Atomic Vapor Laser Isotope Separation (AVLIS) technology as well as ElectroMagnetic (EM) separation technology has been evaluated. It is concluded that such an AVLIS would be about 10 times less expensive than a facility based on electromagnetic separation - \$17 M versus \$170 M. In addition, the AVLIS facility footprint would be about 10 times smaller, and operations would require about 4 years (including 2 years of startup) versus about 11 years for an EM facility.

NTIS

*Cost Estimates; Isotope Separation; Isotopes; Lasers*

**20060003024** Lawrence Livermore National Lab., Livermore, CA USA

**Object Oriented, Finite Element Framework for Linear Wave Equations**

Koning, J. M.; Mar. 2004; 268 pp.; In English

Report No.(s): DE2005-15014610; UCRL-TH-206232; No Copyright; Avail.: National Technical Information Service (NTIS)

This dissertation documents an object oriented framework which can be used to solve any linear wave equation. The linear wave equations are expressed in the differential forms language. This differential forms expression allows a strict discrete interpretation of the system. The framework is implemented using the Galerkin Finite Element Method to define the discrete differential forms and operators. Finite element basis functions including standard scalar Nodal and vector Nedelec basis functions are used to implement the discrete differential forms resulting in a mixed finite element system. Discretizations of scalar and vector wave equations in the time and frequency domains will be demonstrated in both differential forms and vector calculi. This framework conserves energy, maintains physical continuity, is valid on unstructured grids, conditionally stable and second order accurate. Examples including linear electrodynamics, acoustics, elasticity and magnetohydrodynamics are demonstrated.

NTIS

*Finite Element Method; Linear Equations; Wave Equations*

**20060003040** Lawrence Livermore National Lab., Livermore, CA USA

**Novel High Order Time Domain Vector Finite Element Method for the Simulation of Electromagnetic Devices**

Rieben, R. N.; Jul. 23, 2004; 190 pp.; In English

Report No.(s): DE2005-15014486; UCRL-TH-205466; No Copyright; Avail.: National Technical Information Service (NTIS)

The first part concerns the development of a numerical method for solving Maxwell's equations on unstructured hexahedral grids that employs both high order spatial and high order temporal discretizations. The second part involves the use of this method as a computational tool to perform high fidelity simulations of various electromagnetic devices such as optical transmission lines and photonic crystal structures to yield a level of accuracy that has previously been computationally cost prohibitive. This work is based on the initial research of Daniel White who developed a provably stable, charge and energy conserving method for solving Maxwell's equations in the time domain that is second order accurate in both space and time. The research presented here has involved the generalization of this procedure to higher order methods.

NTIS

*Electromagnetic Fields; Finite Element Method; Simulation*

## 71 ACOUSTICS

Includes sound generation, transmission, and attenuation. For noise pollution see *45 Environment Pollution*. For aircraft noise see also *02 Aerodynamics* and *07 Aircraft Propulsion and Power*.

**20060003046** Saxpy Computer Corp., Sunnyvale, CA, USA

### **An Accuracy Analysis of the Kumaresan-Tufts Method for Estimating Complex Damped Exponentials**

Friedlander, Benjamin; Porat, Boaz; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 16.3.1 - 16.3.4; In English; See also 20060003045

Contract(s)/Grant(s): N00014-84-C-0408; Copyright; Avail.: Other Sources

Recently, Kumaresan and Tufts (KT) presented a method for estimating the parameters of damped exponential waveforms in additive white noise. The KT method uses singular value decomposition (SVD) of the data matrix, with truncation and backward prediction to improve the accuracy of the estimates. The KT method was demonstrated to have a very good performance, in comparison with traditional methods used for the same problem. In this paper we provide a quantitative accuracy analysis of the KT method. The analysis is based on first order Taylor series approximations of the estimated parameters around their true values. Results of the analysis were illustrated by some numerical examples in [3]. These results confirm the good performance of the KT method, and show the effect of the user chosen parameters on the accuracy of the estimates.

Author

*Quantitative Analysis; Decomposition; Estimating; White Noise; Accuracy*

**20060003052** Xerox Palo Alto Research Center, CA, USA

### **Acoustic-phonetic Segment Classification and Scale-Space Filtering**

Withgott, Meg; Bagley, Steven C.; Lyon, Richard F.; Bush, Marcia A.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. -20.17.1 - 20.17.4; In English; See also 20060003045

Contract(s)/Grant(s): N00014-86-C-8996; N00039-85-C-0585; Copyright; Avail.: Other Sources

Scale-space filtering represents one method for automatically extracting both coarse and fine-grained units from the speech signal. We examine the acoustic-phonetic structure of segments obtained by scale-space filtering of cochleagrams, and report on the correspondences between scale-space segments which are automatically derived and hand-marked acoustic-phonetic segments. The major advantage of this proposal for segmentation is the flexibility of the data structure.

Author

*Acoustic Properties; Phonetics; Data Structures; Classifications*

**20060003067** Arizona State Univ., Tempe, AZ, USA

### **Signal Enhancement Using Canonical Projection Operators**

Cadzow, James A.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 16.5.1 - 16.5.4; In English; See also 20060003045

Contract(s)/Grant(s): N00014-86-K-0540; N00039-85-C-0222; Copyright; Avail.: Other Sources

A commonly occurring signal processing application is concerned with the task of resurrecting a signal from a noisy and distorted measurement of that signal. It is often known that the underlying signal possesses well-defined properties which are obscured through the measurement process. A signal enhancement algorithm is herein developed which slightly modifies the measured signal so that the modified (or enhanced) signal takes on these prescribed properties. As such, the modified signal often provides a more accurate characterization of the underlying signal.

Author

*Noise Measurement; Signal Processing; Distortion; Algorithms*

**20060003069** Tektronix, Inc., Beaverton, OR, USA

### **Digital Spectra of Non-Uniformly Sampled Signals with Applications to Digitally Synthesized Sinusoids**

Jeng, Y. C.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 16.9.1 - 16.9.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

The overwhelming majority of the digital signal processing theories developed so far have been concentrated on uniformly sampled signals. In this paper we develop a systematic approach to compute the digital spectra of a class of digital signals obtained by nonuniformly sampling analog signals. This development is motivated by the need to characterize the

spectra property of a digitally synthesized sinusoidal waveform. The full representation of the spectral components of a digitally synthesized sinusoidal signal is derived. From that representation, we prove some important properties which provide great insight into the spectral characteristics of a digitally synthesized sinusoid.

Author

*Sampling; Signal Processing; Sine Waves*

**20060003080** International Business Machines Corp., Rome, Italy

**A Speech Recognition System for the Italian Language**

D'Orta, Paolo; Ferretti, Marco; Martelli, Alex; Melecrinis, Sergio; Scarci, Stefano; Volpi, Giampiero; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 20.12.1 - 20.12.3; In English; See also 20060003045; Copyright; Avail.: Other Sources

A real-time speech recognition system for Italian, based on a probabilistic approach, has been developed at the IBM Rome Research Center. It handles natural language sentences, from a 3000-word dictionary, dictated with words separated by short pauses. The architecture consists of an IBM 3090 mainframe and a PC/AT equipped with signal processing hardware. Recognition experiments have been performed for several speakers, each of whom had previously trained the system by dictating a 15-minute text. The paper describes the system, gives results and outlines future developments.

Author

*Speech Recognition; Natural Language (Computers); Words (Language); Central Processing Units; Signal Processing; Real Time Operation*

**20060003088** Entropic Speech, Inc., Cupertino, CA, USA

**Spectral Estimation of Quasi-Periodic Data**

Narayan, Shankar; Burg, John Parker; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 22A2.1 - 22A2.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

A computationally efficient algorithm for estimating the auto-correlation function and the spectrum of periodic/quasi-periodic time-series, when the information about its period is available, is described. Simulation results involving speech data are presented.

Author

*Autocorrelation; Estimating; Spectra; Algorithms*

**20060003098** Illinois Univ., Urbana-Champaign, IL, USA

**Three-Dimensional Motion Estimation by Synthetic Aperture Underwater Acoustic Systems**

Lee, Hua; Huang, Thomas S.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 26.5.1 - 26.5.4; In English; See also 20060003045

Contract(s)/Grant(s): NSF IST-84-09633; NSF ECS-84-51484; Copyright; Avail.: Other Sources

In this paper, we present a motion estimation technique for coherent underwater acoustic imaging systems. This technique does not require point feature selection or matching correspondence identification. The rotation matrix is estimated from the covariance matrices of the amplitude distributions of the wavefield spectra, and the translation vector can be obtained subsequently from the phase change in the spatial-frequency domain.

Author

*Acoustic Imaging; Synthetic Apertures; Three Dimensional Motion; Underwater Acoustics*

**20060003101** NTT Electrical Communications Labs., Tokyo, Japan, Bell Telephone Labs., Inc., Murray Hill, NJ, USA

**Speech Recognition with a Noise-Adapting Codebook**

Roe, David B.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 27.5.1 - 27.5.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

Speech recognizers trained in quiet conditions but operating in noise usually have poor accuracy. This paper reports two methods for improving the accuracy of an LPC vector-quantization speech recognizer by adapting the vector codebook to noisy conditions. First, each codebook vector is changed to reflect the way people speak in noise. Second, the estimated spectrum of the background noise is added to the codebook vectors. These ideas have been tested on a total of 2400 utterances of digits recorded in a car by 4 speakers. A baseline word spotter similar to NTT's SPLIT system was modified by adapting its vector codebook to noise. This adapted codebook, when used with a new decision criterion, yields error rates at least 4 times

lower for noisy conditions. The accuracy is significantly better than without codebook adaptation techniques.

Author

*Background Noise; Speech Recognition; Words (Language)*

**20060003104** Technische Hogeschool, Delft, Netherlands

**On Increasing the Convergence Rate of Regularized Iterative Image Restoration Algorithms**

Lagendijk, Reginald L.; Mersereau, Russell M.; Biemond, Jan; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987; In English; See also 20060003045

Contract(s)/Grant(s): DAAG29-84-0024; Copyright; Avail.: Other Sources

In a regularized iterative algorithm was described which has been shown to be very suitable for solving the ill-posed image restoration problem. By incorporating deterministic constraints and adaptivity this very general algorithm is capable of achieving both noise suppression and ringing reduction in the restoration process. It consumes, however, considerable computation to obtain a (visually) stable solution due to the low convergence speed of the algorithm. The purpose of this paper is to investigate the possibilities for speeding up the convergence of this restoration method. To this end we compare the classical steepest descent algorithm (with linear convergence) with a conjugate gradients based method (superlinear convergence) and a new Q-th order converging algorithm. The latter solution method has the highest convergence rate, but is restricted in its application to space-invariant image restoration with a linear constraint. Although the actual convergence speed of the algorithms involved generally depends on the image data to be restored, it will be shown that for real-life images the constrained conjugate gradients algorithm yields a considerable convergence speed improvement.

Author

*Algorithms; Convergence; Restoration*

**20060003112** Bell Telephone Labs., Inc., Murray Hill, NJ, USA

**A Frequency-Weighted Itakura Spectral Distortion Measure and Its Application to Speech Recognition in Noise**

Soong, F. K.; Sondhi, M. M.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 15.1.1 -15.1.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

The performance of a recognizer based on the Itakura spectral distortion measure deteriorates when speech signals are corrupted by noise, specially if it is not feasible to train and to test the recognizer under similar noise conditions. To alleviate this problem, we consider a more noise-resistant, weighted spectral distortion measure which weights the high SNR regions in frequency more than the low SNR regions. For the weighting function we choose a "bandwidth broadened" test spectrum; it weights spectral distortion more at the peaks than at the valleys of the spectrum. The amount of weighting is adapted according to an estimate of SNR, and becomes essentially constant in the noise-free case. The new measure has the dot product form and computational efficiency of the Itakura distortion measure in the autocorrelation domain. It has been tested on a 10 speaker, isolated digit data base in a series of speaker independent speech recognition experiments. Additive white Gaussian noise was used to simulate different SNR conditions (from 5 dB to co dB). The new measure performs as well as the original unweighted Itakura distortion measure at high SNR's, and significantly better at medium to low SNRs. At an SNR of 5 dB, the new measure achieves a digit error rate of 12.4% while the original Itakura distortion gives an error rate of 27.6%. The equivalent SNR improvement at low SNR's, is about 5-7 dB.

Author

*Speech Recognition; Random Noise; Weighting Functions; High Frequencies; Autocorrelation*

**20060003113** Yale Univ., New Haven, CT, USA

**Errors in Determining Vocal Tract Shape from the Acoustic Signal**

Kuo, Roman; Han, Hee; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 15.2.1 - 15.2.4; In English; See also 20060003045

Contract(s)/Grant(s): NSF ECS-83-0782; Copyright; Avail.: Other Sources

This paper presents the results of an experimental study on the errors associated with determining the shape of a vocal tract from the acoustic output signal. A vocal tract model was constructed from plexiglas sections of constant thickness, each having a hole of a specified area, that closely approximated a lossless autoregressive (AN) system. A small wide-band speaker acted as the excitation source. Linear prediction procedures were applied to the observed signals to estimate the shape of the tube. These values were then compared to the actual values to determine the error. The results indicate the experimental and

signal processing conditions required for the estimates of the vocal tract shape to approximate the actual shape.

Author

*Acoustics; Sound Waves; Errors; Prediction Analysis Techniques; Sound Transmission; Signal Processing*

**20060003114** Bolt, Beranek, and Newman, Inc., Cambridge, MA, USA

**Rapid Speaker Adaptation Using a Probabilistic Spectral Mapping**

Schwartz, Richard; Chow, Yen-Lu; Kubala, Francis; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 15.3.1 - 15.3.4; In English; See also 20060003045

Contract(s)/Grant(s): N00014-85-C-0279; Copyright; Avail.: Other Sources

This paper deals with rapid speaker adaptation for speech recognition. We introduce a new algorithm that transforms hidden Markov models of speech derived from one 'prototype' speaker so that they model the speech of a new speaker. The speaker normalization is accomplished by a probabilistic spectral mapping from one speaker to another. For a 350 word task with a grammar and using only 15 seconds of speech for normalization, the recognition accuracy is 97% averaged over 6 speakers. This accuracy would normally require over 5 minutes of speaker dependent training. We derive the probabilistic spectral transformation of HMMs, describe an algorithm to estimate the transformation, and present recognition results.

Author

*Speech Recognition; Algorithms; Transformations (Mathematics); Words (Language)*

**20060003115** Tokyo Univ., Japan

**Estimation of Voice Source and Vocal Tract Parameters Based on ARMA Analysis and a Model for the Glottal Source Waveform**

Fujisaki, Hiroya; Ljungqvist, Mats; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 15.4.1 - 15.4.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

Conventional speech analysis methods based on linear prediction often fail to separate and estimate the source and vocal-tract characteristics, especially in the case of voiced sounds, because of oversimplified assumptions regarding the voice source. We have already proposed a model that is capable of expressing a wide range of voice source characteristics, and demonstrated that source and vocal-tract parameters can be well separated and correctly estimated, for vowel and vowel-like sounds, by combining the proposed source model with the linear predictive analysis. The present paper extends our approach to apply to a wider variety of speech sounds including nasal vowels and nasal consonants, by combining the proposed source model with the ARMA analysis. The validity of the system was demonstrated by analysis of synthetic and natural speech.

Author

*Consonants (Speech); Linear Prediction; Vowels; Autoregressive Moving Average*

**20060003117** Massachusetts Inst. of Tech., Lexington, MA, USA

**Mixed-Phase Deconvolution of Speech on a Sine-Wave Model**

Quatieri, Thomas F.; McAulay, Robert J.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 15.7.1 - 15.7.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

This paper describes a new method of deconvolving the vocal cord excitation and vocal tract system response. The technique relies on a sine-wave representation of the speech waveform and forms the basis of an analysis-synthesis method which yields synthetic speech essentially indistinguishable from the original. Unlike an earlier sinusoidal analysis-synthesis technique that used a minimum-phase system estimate, the approach in this paper generates a 'mixed-phase' system estimate and thus an improved decomposition of excitation and system components. Since a mixed-phase system estimate is removed from the speech waveform, the resulting excitation residual is less dispersed than the previous sinusoidal-based excitation estimate or the more commonly used linear prediction residual. A method of time-varying linear filtering is given as an alternative to sinusoidal reconstruction, similar to conventional time-domain synthesis used in certain vocoders, but without the requirement of pitch and voicing decisions. Finally, speech modification with a mixed-phase system estimate is shown to be capable of more closely preserving waveform shape in time-scale and pitch transformations than the earlier approach.

Author

*Decomposition; Vocal Cords; Linear Prediction; Sine Waves; Excitation*

**20060003118** Rhode Island Univ., Kingston, RI, USA

**Signal Modeling by Exponential Segments and Application in Voiced Speech Analysis**

Parthasarathy, S.; Tufts, D. W.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 645-648; In English; See also 20060003045; Copyright; Avail.: Other Sources

The analysis of signals that can be represented as a linear combination of exponentially damped sinusoids where the values of damping factors, frequencies, and the linear combination coefficients change at certain transition times is considered. These transitions represent the opening and closing of the glottis in the case of speech signals. Techniques are presented for the accurate estimation of the exponential parameters and the times of transition, from noise corrupted observations of the signal. The exponential parameters are obtained by improved linear prediction techniques using low-rank approximations, and further refined by an iterative least-squares technique with stability constraints imposed on the damping factors. Optimal estimates (in the least-squares sense) of the time of transition are presented. Our knowledge of the signal structure is used to obtain improved performance and also a computationally efficient estimation algorithm. Experiments with real, connected speech indicate that the speech waveforms can be accurately represented from a small number of parameters using the analysis presented here. the parameters. These problems and some solutions are discussed in the rest of this paper.

Author

*Linear Prediction; Coefficients; Sine Waves; Algorithms; Estimates*

**20060003123** International Business Machines Corp., Yorktown Heights, USA

#### **Experiments with the Tangora 20,000 Word Speech Recognizer**

Averbuch, A.; Bahl, L.; Bakis, R.; Brown, P.; Daggett, G.; Das, S.; Davies, K.; DeGennaro, S.; deSouza, P.; Epstein, E., et al.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 17.3.1 - 17.3.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

The Speech Recognition Group at IBM Research in Yorktown Heights has developed a real-time, isolated-utterance speech recognizer for natural language based on the IBM Personal Computer AT and IBM Signal Processors. The system has recently been enhanced by expanding the vocabulary from 5,000 words to 20,000 words and by the addition of a speech workstation to support usability studies on document creation by voice. The system supports spelling and interactive personalization to augment the vocabularies. This paper describes the implementation, user interface, and comparative performance of the recognizer.

Author

*Speech Recognition; IBM Personal Computers; Signal Processing; Signal Analyzers; Decoders*

**20060003126** Massachusetts Inst. of Tech., Lexington, MA, USA

#### **Cepstral Domain Stress Compensation for Robust Speech Recognition**

Chen, Yeunung; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987; See also 20060003045; Copyright; Avail.: Other Sources

Automatic speech recognition algorithms generally rely on the assumption that for the distance measure used, intraword variabilities are smaller than interword variabilities so that appropriate separation in the measurement space is possible. As evidenced by degradation of recognition performance, the validity of such an assumption decreases from simple tasks to complex tasks, from cooperative talkers to casual talkers, and from laboratory talking environments to practical talking environments. This paper presents a study of talker-stress-induced intraword variability, and an algorithm that compensates for the systematic changes observed. The study is based on Hidden Markov Models trained by speech tokens in various talking styles. The talking styles include normal speech, fast speech, loud speech, soft speech, and talking with noise injected through earphones; the styles are designed to simulate speech produced under real stressful conditions. Cepstral coefficients are used as the parameters in the Hidden Markov Models. The stress compensation algorithm compensates for the variations in the cepstral coefficients in a hypothesis-driven manner. The functional form of the compensation is shown to correspond to the equalization of spectral tilts. Preliminary experiments indicate that a substantial reduction in recognition error rate can be achieved with relatively little increase in computation and storage requirements.

Author

*Speech Recognition; Cepstral Analysis; Talking; Coefficients*

**20060003152** Widener Univ., Chester, PA, USA

#### **Optimal Window-Transforms for FIR Digital Filters Design**

Johnson, Alfred T., Jr.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 888-891; In English; See also 20060003045; Copyright; Avail.: Other Sources

A method is given for optimizing the frequency response of finite impulse response (FIR) digital filters designed by frequency sampling. The impulse response of the filter is multiplied by a window computed by optimizing its discrete Fourier transform. A multidimensional search is used to minimize the maximum deviation of the frequency response from the design

specifications. The optimal window-transform method has two advantages over conventional minimax optimal design methods. One advantage is that the multidimensional search is carried out over a much smaller number of parameters. For example, it has been found that the stop-band attenuation of low-pass filters designed by this method is approximately 50 dB when optimized over one parameter and 80 dB when optimized over two parameters. The other advantage is that the functional form of the optimal window-transform with a given number of parameters is nearly constant over an entire class of filters, such as the low-pass filters, so nearly optimal prototype windows may be found.

Author

*Design Analysis; Digital Filters; Fourier Transformation; Low Pass Filters*

**20060003168** Centre National de la Recherche Scientifique, Orsay, France

**Speech Analysis and Reconstruction Using Short-Time, Elementary Waveforms**

Lienard, Jean-Sylvain; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 22A3.1 - 22A3.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

We consider the speech signal to be composed of elementary waveforms, wf, (windowed sinusoids), each one defined by a small number of parameters. The typical duration of a wf is of the order of magnitude of a pitch period in the voiced segments, and a few milliseconds in the noise segments. No preliminary evaluation of voicing or pitch is required; this largely differentiates the approach from the classical pitch-synchronous analysis. The analysis process uses a , designed to introduce as few time distortions as possible. The signal at the output of each filter is segmented according to successive amplitude minima, and each segment is modeled by a wf. This decomposition can be validated by reconstructing the wfs from their parameters, and summing them in order to recover a signal perceptually equivalent to the original.

Author

*Decomposition; Sine Waves; Waveforms*

**20060003183** Rhode Island Univ., Kingston, RI, USA

**Optimal Detection in Colored Non-Gaussian Noise with Unknown Parameters**

Kay, Steven; Sengupta, Debasis; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 1087-1090; In English; See also 20060003045; Copyright; Avail.: Other Sources

The problem of detecting a signal known except for amplitude in incompletely characterized non-Gaussian noise is addressed. The use of a generalized likelihood ratio test or its asymptotically equivalent form, the Rao test, is shown to produce a detector that has the identical asymptotic performance as a generalized likelihood ratio test designed with a priori knowledge of the unknown noise parameters. Since the latter clairvoyant detector always produces an upper bound on performance, the generalized likelihood ratio test is optimum. An example is given in which the noise is modeled as an autoregressive process with a mixed-Gaussian noise excitation. Results of a computer simulation are described which verify the theory.

Author

*Computerized Simulation; Detection; Color; Autoregressive Processes*

**20060003184** Groupe de Etude et de Recherche en Detection Sous-Marine, Toulon, France

**Minimax Robust Receiver in Coloured Noise for Local Deflection**

Bouvet, Michel; Picinbono, Bernard; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 26.3.1 - 26.3.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

When dealing with uncertainties, the robust approach, using the games theory, assures a minimal level of performance. In this paper, we address the problem of robust signal detection in coloured unknown noise. The detection criterion we use is the local deflection (or relative efficiency). The minimax approach shows that the robust filter corresponds to the Gaussian density function which gives the matched filter.

Author

*Color; Deflection; Matched Filters; Minimax Technique; Receivers; Random Noise*

**20060003185** IBM Federal Systems Div., Manassas, VA, USA

**Thresholds in Combined Detection and Source Motion Estimation**

Johnson, G. W.; Bradford, W. A.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 1095-1098; In English; See also 20060003045; Copyright; Avail.: Other Sources

Estimating both the presence and the angle-of-arrival history of a broadband source at an array-of-hydrophones is an important problem in underwater acoustics. Optimal detection and estimation can be combined using a conventional Eckart

filter and fixed beamformer, followed by a parallel bank of motion-hypothesis testing matched filters. The number of motion hypotheses required depends on the amount of apriori source motion uncertainty. This paper presents theoretical and empirical results which quantify optimal performance as a function of apriori motion uncertainty, including threshold losses. In general, combined detection and estimation performance improves as the apriori uncertainty in source motion is reduced.

Author

*Detection; Underwater Acoustics*

**20060003186** Bell Telephone Labs., Inc., Whippany, NJ, USA

**The Effects of Cross-Correlated Noise and Multi-Channel Signal on ORing Loss**

Bottomiey, Gregory E.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 26.6.1 - 26.6.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

To reduce the amount of information presented to a human observer, ORing has been used to combine frequency-time plots from several acoustic channels. ORing introduces a loss which is measured as a rise in the minimum detectable signal-to-noise ratio. Equations for ORing loss are derived for a general signal processing system with arbitrary signal and noise distribution. Results are provided for the case of Gaussian noise and Gaussian signal. Simulation is used to verify the analytical results, and to provide insight into how cross-correlated noise and signal present on multiple channels reduce ORing loss. Results suggest: 1) if signal is present on only one channel, noise correlation reduces ORing loss, but not as much as currently estimated, and 2) if noise is independent from channel to channel, signal on more than one channel also reduces ORing loss. However, the two effects are not independent. Consequently, they must be considered together when estimating ORing loss.

Author

*Acoustics; Channels (Data Transmission); Cross Correlation; Sound Transmission*

**20060003192** IBM Federal Systems Div., Yorktown Heights, NY, USA

**Increased Noise Immunity in Large Vocabulary Speech Recognition with the Aid of Spectral Subtraction**

Van Compernelle, Dirk; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 1143-1146; In English; See also 20060003045; Copyright; Avail.: Other Sources

This paper presents several ways of making the signal processing in the IBM speech recognition system more robust with respect to variations in the background noise level. The underlying problem is that the speech recognition system trains on the specific noise circumstances of the training session. A simple solution lies in the controlled addition of noise. The level of noise that has to be added in the effectively mask all background noise is rather high and causes a significant reduction in accuracy. Spectral subtraction does a better job in a limited number of cases, but the thresholding in spectral subtraction often leads to training problems in the hidden Markov model based recognition system. The best results were obtained by reintroducing a semi-natural background by adding noise after applying spectral subtraction

Author

*Background Noise; Noise Intensity; Speech Recognition*

**20060003642** Concordia Univ., Montreal, Quebec, Canada

**Two Methods for the Reduction of Quantization Effects in Recursive Digital Filters**

Charalambous, C.; Antoniou, A.; Motamedi, Z.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1049-1052; In English; See also 20060003631; Copyright; Avail.: Other Sources

Two distinct methods for the reduction of coefficient and product quantization effects in recursive digital filters are described. A degree of freedom is introduced in the design by increasing the approximation order above the minimum. This is then used to increase the allowable margin for coefficient quantization error or to reduce the sensitivity to coefficient quantization. The two methods have been used to design a diverse range of lowpass filters, including some narrowband as well as high-selectivity filters. The results obtained reveal that the two methods lead to significant reductions in the required wordlength and in the in-band noise power.

Author

*Noise Reduction; Frequencies; Digital Filters*

**20060003752** Calgary Univ., Alberta, Canada

**Stability, Dynamic Range and Roundoff Noise in a New Second Order Recursive Digital Filter**

Liu, E. S. K.; Turner, L. E.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 1046-1048; In English; See also 20060003631; Copyright; Avail.: Other Sources

The limit cycle and roundoff noise behavior of a new second-order digital filter are examined. By using magnitude truncation, this digital filter is shown to be free from constant input limit cycles. Highpass, lowpass and bandpass transfer functions can be readily obtained by using only two multipliers, two delay elements and five adders. A closed form expression of the normalized unit noise gain is derived and is compared with the noise gain of other well known second-order structures.

Author

*Digital Filters; Dynamic Range; Stability; Noise Measurement*

## 72

### ATOMIC AND MOLECULAR PHYSICS

Includes atomic and molecular structure, electron properties, and atomic and molecular spectra. For elementary particle physics see 73 *Nuclear Physics*.

**20060002842** Norfolk State Univ., VA, USA

#### **Jefferson Lab Experiments Shed New Light on the Proton**

Punjabi, V.; January 2005; 20 pp.; In English

Report No.(s): DE2005-850153; No Copyright; Avail.: National Technical Information Service (NTIS)

In experiments 93-027 and 99-007 at Jefferson Lab (JLab) the ratio of the electromagnetic elastic form factors of the proton,  $G_E(\text{sub } p)/G_M(\text{sub } p)$ , was measured with high precision, up to four momentum transfer  $Q^2$  of 3.5  $\text{GeV}^2$  and 5.6  $\text{GeV}^2$ , respectively, with the recoil polarization technique. The data from these two JLab experiments have shown an unexpected and significantly different  $Q^2$ -dependence for the electric and magnetic form factors, starting at about  $Q^2=1 \text{ GeV}^2$ , up to the maximum value of 5.6  $\text{GeV}^2$ , revealing a definite difference in spatial distribution of charge and magnetization at short distances. The combined results of the two JLab experiments were surprising as they appeared to contradict the consensus based on Rosenbluth separation results for  $(G_E(\text{sub } p))^2$  and  $G_M(\text{sub } p)^2$ : the ratio  $(\mu_p)G_E(\text{sub } p)/G_M(\text{sub } p)$  obtained with the Rosenbluth method appear to be near 1 up to about 6  $\text{GeV}^2$ . This un-bridgeable difference between cross section and polarization experiments has been reinforced with two recent JLab Rosenbluth experiments; it appears increasingly difficult to explain it away by methodological or systematic errors.

NTIS

*Protons; Form Factors*

**20060002857** Lawrence Livermore National Lab., Livermore, CA USA

#### **Estimated (n,f) Cross Sections for $^{236,236m,237,238}\text{Np}$ , $^{237,237m}\text{Pu}$ , and $^{240,241,242,242m,243,244,244m}\text{Am}$ Isotopes**

Younes, W.; Britt, H. C.; Becker, J. A.; Jan. 16, 2004; 56 pp.; In English

Report No.(s): DE2005-15013937; UCRL-TR-201913; No Copyright; Avail.: Department of Energy Information Bridge

No abstract available

*Estimating; Isotopes; Neutrons*

**20060002970** Lawrence Livermore National Lab., Livermore, CA USA

#### **Search for X-ray Induced Decay of the 31-yr Isomer of $^{178}\text{Hf}$ Using Synchrotron Radiation**

Ahmad, I.; Banar, J. C.; Becker, J. A.; Bredewag, T. A.; Cooper, J. R.; Sep. 16, 2004; 52 pp.; In English

Report No.(s): DE2005-15011624; UCRL-TR-206598; No Copyright; Avail.: National Technical Information Service (NTIS)

Isomeric ( $^{178}\text{Hf}$ ) ( $t_{1/2} = 31 \text{ yr}$ ,  $E_x = 2.446 \text{ MeV}$ ,  $J(\pi) = 16^+$ ) was bombarded by a white beam of x-rays from the Advanced Photon Source at Argonne National Laboratory. A search was made for x-ray induced decay of the isomer by detecting prompt and delayed ( $\gamma$ ) rays associated with the decay. No induced decay was observed. Upper limits for such a process for x-ray energies between 7-100 keV were set. The limits between 7 and 30 keV are below (approx.)  $3 \times 10^{-27} \text{ cm}^2\text{-keV}$  for induced decay that bypasses the 4-s isomer and (approx.)  $5 \times 10^{-27} \text{ cm}^2\text{-keV}$  for induced decay that is delayed through this isomer, orders of magnitude below values at which induced decay was reported previously. These limits are consistent with what is known about the properties of atomic nuclei.

NTIS

*Isomers; Synchrotron Radiation; X Ray Sources; X Rays*

73  
**NUCLEAR PHYSICS**

Includes nuclear particles; and reactor theory. For space radiation see *93 Space Radiation*. For atomic and molecular physics see *72 Atomic and Molecular Physics*. For elementary particle physics see *77 Physics of Elementary Particles and Fields*. For nuclear astrophysics see *90 Astrophysics*.

**20060002849** Argonne National Lab., IL USA

**Repository Benefits of AFCI Options**

Wigeland, R. A.; Bauer, T. H.; January 2005; 54 pp.; In English

Report No.(s): DE2005-842065; ANL-AFCI-129; No Copyright; Avail.: National Technical Information Service (NTIS)

The results described in this report summarize the evaluations of potential benefits to a geologic repository for a variety of AFCI options that were studied during FY04. Many of the options were examined in response to a request by Burton Richter, chair of the Advanced Nuclear Transformation Technology (ANTT) Subcommittee of NERAC, to perform an initial evaluation of the potential benefit to a geologic repository from processing commercial spent nuclear fuel to separate certain chemical elements and to recycle some of these elements in thermal spectrum reactors such as light water reactors. The measure of repository benefit has been defined as the allowable increase in repository drift loading consistent with satisfying all repository thermal design limits, since loading of a geologic repository at Yucca Mountain is currently limited by temperature constraints. Such an increase in drift loading can be used to either reduce the size of a repository of given capacity, or to increase the capacity of a repository of a given size. Any changes in estimated peak dose caused by the resulting alteration in the radionuclide inventory of the repository have not been evaluated, but are the subject of a separate ongoing study.

NTIS

*Nuclear Fuels; Nuclear Transformations; Spent Fuels*

**20060002861** Lawrence Livermore National Lab., Livermore, CA USA

**Shell Model in a First Principles Approach**

Navratil, P.; Jan. 15, 2004; 14 pp.; In English

Report No.(s): DE2005-15014004; UCRL-PROC-201765; No Copyright; Avail.: Department of Energy Information Bridge

We develop and apply an ab-initio approach to nuclear structure. Starting with the NN interaction, that fits two-body scattering and bound state data, and adding a theoretical NNN potential, we evaluate nuclear properties in a no-core approach. For presently feasible no-core model spaces, we evaluate an effective Hamiltonian in a cluster approach which is guaranteed to provide exact answers for sufficiently large model spaces and/or sufficiently large clusters. A number of recent applications are surveyed including an initial application to exotic multiquark systems.

NTIS

*Hamiltonian Functions; Nuclear Reactions*

**20060002862** Lawrence Livermore National Lab., Livermore, CA USA

**Modeling of Fission Neutrons as a Signature for Detection of Highly Enriched Uranium**

Wolford, J. K.; Frank, M. I.; Descalle, M. A.; Mar. 2004; 18 pp.; In English

Report No.(s): DE2005-15014020; UCRL-CONF-202869; No Copyright; Avail.: National Technical Information Service (NTIS)

We present the results of modeling intended to evaluate the feasibility of using neutrons from induced fission in highly enriched uranium (HEU) as a means of detecting clandestine HEU, even when it is embedded in absorbing surroundings, such as commercial cargo. We characterized radiation from induced fission in HEU, which consisted of delayed neutrons at all energies and prompt neutrons at energies above a threshold. We found that for the candidate detector and for the conditions we considered, a distinctive HEU signature should be detectable, given sufficient detector size, and should be robust over a range of cargo content. In the modeled scenario, an intense neutron source was used to induce fissions in a spherical shell of HEU. To absorb, scatter, and moderate the neutrons, we place one layer of simulated cargo between the source and target and an identical layer between the target and detector. The resulting neutrons and gamma rays are resolved in both time and energy to reveal the portion arising from fission. We predicted the dominant reaction rates within calcium fluoride and liquid organic scintillators. Finally, we assessed the relative effectiveness of two common neutron source energies.

NTIS

*Fission; Fissionable Materials; Neutrons; Radiation Detectors*

## 74 OPTICS

Includes light phenomena and the theory of optical devices; for specific optical devices see also *35 Instrumentation and Photography*.  
For lasers see *36 Lasers and Masers*.

**20060002738** Lawrence Livermore National Lab., Livermore, CA USA

### **Actinic Mask Inspection at the ALS: Risk Reduction Activities for 2003**

Barty, A.; Levesque, R.; Ayers, J.; Liu, Y.; Gullikson, E.; Jan. 2004; 34 pp.; In English

Report No.(s): DE2005-15013831; UCRL-SR-201686; No Copyright; Avail.: Department of Energy Information Bridge

This document reports on risk reduction activities performed at the VNL during CY2003 as part of the Lith-343 actinic inspection project funded by International SEMATECH. The risk reduction activities described in this document comprise deliverable items 3.1.3, 3.1.4, 3.1.5 and 3.1.6 of Amendment 6 to the VNL EUV mask blank technology transfer contract. Zone plates for use in the AIM mode imaging part of the tool have been fabricated and are ready to use. Two designs were fabricated: one set on a Silicon Nitride membrane, and one set of free-standing zone plates. SEM images of both the free-standing and supported zone plates indicate that they have been fabricated to the required specifications are included in this report.

NTIS

*Inspection; Masks; Risk*

**20060002757** Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA

### **Airborne Megawatt Class Free-Electron Laser for Defense and Security**

Whitney, R.; Douglas, D.; Neil, G.; January 2005; 16 pp.; In English

Report No.(s): DE2005-841301; No Copyright; Avail.: Department of Energy Information Bridge

An airborne megawatt (MW) average power Free-Electron Laser (FEL) is now a possibility. In the process of shrinking the FEL parameters to fit on ship, a surprisingly lightweight and compact design has been achieved. There are multiple motivations for using a FEL for a high-power airborne system for Defense and Security: Diverse mission requirements can be met by a single system. The MW of light can be made available with any time structure for time periods from microseconds to hours, i.e. there is a nearly unlimited magazine. The wavelength of the light can be chosen to be from the far infrared (IR) to the near ultraviolet (UV) thereby best meeting mission requirements. The FEL light can be modulated for detecting the same pattern in the small fraction of light reflected from the target resulting in greatly enhanced targeting control. The entire MW class FEL including all of its subsystems can be carried by large commercial size airplanes or on an airship. Adequate electrical power can be generated on the plane or airship to run the FEL as long as the plane or airship has fuel to fly. The light from the FEL will work well with relay mirror systems.

NTIS

*Airborne Lasers; Antimissile Defense; Free Electron Lasers; Security*

**20060002759** Nuonics, Inc., Winter Park, FL, USA

### **Ultra-High Temperature Sensors Based on Optical Property Modulation and Vibration-Tolerant Interferometry. (Semiannual Report for January 1, 2005-June 30, 2005.)**

Riza, N. A.; Jul. 22, 2005; 30 pp.; In English

Report No.(s): DE2005-842444; No Copyright; Avail.: National Technical Information Service (NTIS)

The goals of the first six months of this project were to begin laying the foundations for both the SiC front-end optical chip fabrication techniques for high pressure gas species sensing as well as the design, assembly, and test of a portable high pressure high temperature calibration test cell chamber for introducing gas species. This calibration cell will be used in the remaining months for proposed first stage high pressure high temperature gas species sensor experimentation and data processing. All these goals have been achieved and are described in detail in the report. Both design process and diagrams for the mechanical elements as well as the optical systems are provided. Photographs of the fabricated calibration test chamber cell, the optical sensor setup with the calibration cell, the SiC sample chip holder, and relevant signal processing mathematics are provided. Initial experimental data from both the optical sensor and fabricated test gas species SiC chips is provided. The design and experimentation results are summarized to give positive conclusions on the proposed novel high temperature high pressure gas species detection optical sensor technology.

NTIS

*Chips; Fabrication; Interferometry; Modulation; Optical Properties; Silicon Carbides; Temperature Sensors; Vibration*

**20060002768** Grambling State Univ., LA, USA

**Novel Preparation and Magneto Chemical Characterization of Nanoparticle Mixed Alcohol Catalysts. (Report for September 1, 2000 through February 28, 2005)**

January 2005; 34 pp.; In English

Report No.(s): DE2005-843081; No Copyright; Avail.: Department of Energy Information Bridge

We have developed and streamlined the experimental systems: (a) Laser-induced solution deposition (LISD) photosynthesis, ball-milling, and chemical synthesis of Fe, Co, and Cu nanoparticle catalysts; (b) Sol-gel method for mesoporous gamma-Al(sub 2)O(sub 3), SiO(sub 2), hybrid alumina/silica granular supports; (c) Three sol-gel/oil-drop catalyst preparation methods to incorporate metal nanoparticles into mesoporous 1 mm granular supports; (d) Low-cost GC-TCD system with hydrogen as carrier gas for the determination of wide spectrum of alkanes produced during the F-T reactions; and (e) Gas-flow reactor and microchannel reactor for fast screening of catalysts. The LISD method could produce Co, Cu, and Fe (5 nm) nanoparticles, but in milligram quantities. We could produce nanoparticles in gram quantities using high-energy ball milling and chemical synthesis methods. Ball milling gave wide particle size distribution compared to the chemical synthesis method that gave almost uniform size (approx. 5 nm) particles.

NTIS

*Alcohols; Catalysts; Metal Oxides; Metals; Nanoparticles*

**20060002859** California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

**Cross-Check of Different Techniques for Two-Dimensional Power Spectral Density Measurements of X-Ray Optics**

Yashchuk, V. V.; Irick, S. C.; Gullikson, E. M.; Howells, M. R.; January 2005; 16 pp.; In English

Report No.(s): DE2005-843141; No Copyright; Avail.: Department of Energy Information Bridge

The consistency of different instruments and methods for measuring two-dimensional (2D) power spectral density (PSD) distributions are investigated. The instruments are an interferometric microscope, an atomic force microscope (AFM) and the X-ray Reflectivity and Scattering experimental facility, all available at Lawrence Berkeley National Laboratory. The measurements were performed with a gold-coated mirror with a highly polished stainless steel substrate. It was shown that these three techniques provide essentially consistent results. For the stainless steel mirror, an envelope over all measured PSD distributions can be described with an inverse power-law PSD function. It is also shown that the measurements can be corrected for the specific spatial frequency dependent systematic errors of the instruments. The AFM and the X-ray scattering measurements were used to determine the modulation transfer function of the interferometric microscope. The corresponding correction procedure is discussed in detail. Lower frequency investigation of the 2D PSD distribution was also performed with a long trace profiler and a ZYGO GPI interferometer. These measurements are in some contradiction, suggesting that the reliability of the measurements has to be confirmed with additional investigation. Based on the crosscheck of the performance of all used methods, we discuss the ways for improving the 2D PSD characterization of X-ray optics.

NTIS

*Density Measurement; Spectrum Analysis; X Ray Optics*

**20060002864** Lawrence Livermore National Lab., Livermore, CA USA

**Testing LaMgAl<sub>11</sub>O<sub>19</sub> Crystal for X-ray Spectroscopy**

Chen, H.; Beiersdorfer, P.; Baronova, E. O.; Kalashnikova, I. I.; Stepanenko, M. M.; Mar. 31, 2004; 20 pp.; In English

Report No.(s): DE2005-15014074; UCRL-CONF-203300; No Copyright; Avail.: National Technical Information Service (NTIS)

No abstract available

*Aluminates; Crystals; Lanthanum; Magnesium; X Ray Spectroscopy*

**20060002866** Lawrence Livermore National Lab., Livermore, CA USA

**Manufacture of Large-Aperture Diffractive Optics and Ultrathin Refractive Optics for High-Power Laser and Space Applications**

Britten, J. A.; Jan. 18, 2002; 10 pp.; In English

Report No.(s): DE2005-15013387; UCRL-JC-146939; No Copyright; Avail.: Department of Energy Information Bridge

We have developed equipment and technology for fabricating submicron pitch, high efficiency diffraction gratings over meter-scale apertures that are used for pulse compression in ultrafast systems around the world. We have also developed

wet-etch figuring (WEF) to generate arbitrary continuous contours on ultrathin glass substrates in a closed loop process. The current and future states of these technologies will be discussed.

NTIS

*Apertures; Diffractive Optics; Fabrication; Gratings (Spectra); High Power Lasers; Laser Applications; Lasers; Refractivity; Technology Utilization*

**20060002935** Bureau of the Census, Washington, DC, USA

**Economic Census 2002: Manufacturing, Industry Series. Fiber Optic Cable Manufacturing**

Dec. 2004; 50 pp.; In English

Report No.(s): PB2006-103386; EC02-31I-335921(RV); No Copyright; Avail.: CASI: [A03](#), Hardcopy

The economic census is the major source of facts about the structure and functioning of the nation's economy. It provides essential information for government, business, industry, and the general public. Title 13 of the USA Code (Sections 131, 191, and 224) directs the Census Bureau to take the economic census every 5 years, covering years ending in '2' and '7.' The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. The Industry Series, containing 473 reports, covers a single NAICS industry (six-digit code). These reports include such statistics as number of establishments, employment, payroll, value added by manufacture, cost of materials consumed, value of shipments, capital expenditures, etc. The industry reports also include data for states with 100 employees or more in the industry. The data in industry reports are preliminary and subject to change. This U.S. industry comprises establishments primarily engaged in manufacturing insulated fiberoptic cable from purchased fiber-optic strand.

NTIS

*Census; Economic Analysis; Economics; Fiber Optics; Industries; Manufacturing*

**20060003029** Lawrence Livermore National Lab., Livermore, CA USA

**Edge Cladding Gain Media According to IL-11317**

Soules, T.; Feb. 14, 2005; 14 pp.; In English

Report No.(s): DE2005-15015862; UCRL-TR-209699; No Copyright; Avail.: Department of Energy Information Bridge

In this patent application we wish to claim the following approach to ameliorating spontaneous amplified emission (ASE) that occurs in a laser amplifier slab. There are two important elements of our approach. We wish to claim the application of both together but not either one alone. (1) The first element of the invention is to roughen the edge surfaces of the amplifier slab. A rough surface with random planar features larger than the wavelength of light will reflect and refract incident light rays at angles different than the median plane of the surface. The rough surface can then be characterized by two parameters. First there is a distribution of heights about the zero mean plane of the surface. If normal this distribution is characterized by a standard deviation. The second parameter is the correlation distance that describes how close together on average are the peaks and valleys. The ratio of these two numbers determines the spread of light reflected off the surface of the edge of the slab. (2) The second element in our invention is to bond the roughened edges of the gain medium to an ASE absorbing media using a suitable bonding agent. In order for the ASE to leave the gain medium crystal there must be minimal reflection and maximum transmission at the interface. This requires having a near match of the index of refraction of the bonding medium and the amplifier slab material at the wavelength of the ASE. Further if the index of refraction of the bonding agent is less than that of the amplifier there will be some total internal reflection even if the surface is roughened. The index of refraction of GGG is (approx) 1.92 and that of YAG is (approx) 1.84. There are no suitable bonding agents with indices of refraction this high.

NTIS

*Cladding; Lasers; Patent Applications*

## 75

### PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see [46 Geophysics](#). For space plasmas see [90 Astrophysics](#).

**20060002758** Princeton Univ., NJ USA

**Status and Plans for the National Spherical Torus Experimental Research Facility**

Ono, M.; Bell, M. G.; Bell, R. E.; Bialek, J. M.; Bigelow, T.; Jul. 2005; 24 pp.; In English

Report No.(s): DE2005-842078; PPPL-4091; No Copyright; Avail.: National Technical Information Service (NTIS)

An overview of the research capabilities and the future plans on the MA-class National Spherical Torus Experiment (NSTX) at Princeton is presented. NSTX research is exploring the scientific benefits of modifying the field line structure from that in more conventional aspect ratio devices, such as the tokamak. The relevant scientific issues pursued on NSTX include energy confinement, MHD stability at high beta, non-inductive sustainment, solenoid-free start-up, and power and particle handling. In support of the NSTX research goal, research tools are being developed by the NSTX team. In the context of the fusion energy development path being formulated in the US, an ST-based Component Test Facility (CTF) and, ultimately a high beta Demo device based on the ST, are being considered. For these, it is essential to develop high performance (high beta and high confinement), steady-state (non-inductively driven) ST operational scenarios and an efficient solenoid-free start-up concept. We will also briefly describe the Next-Step-ST (NSST) device being designed to address these issues in fusion-relevant plasma conditions.

NTIS

*Research Facilities; Tokamak Devices; Toruses*

**20060002761** Princeton Univ., NJ USA

**Observation of Abrupt and Fast Rising SOL Current during Trigger Phase of ELMs in DIII-D Tokamak**

Takahashi, H.; Fredrickson, E.; Schaffer, M.; Austin, M.; Brooks, N.; Jun. 2005; 12 pp.; In English

Report No.(s): DE2005-841347; PPPL-4089; No Copyright; Avail.: Department of Energy Information Bridge

Extensive studies to date of edge localized modes (ELMs) have sought their origin inside the separatrix, i.e., MHD instability from steep gradients in the plasma edge, and examined their consequences outside the separatrix, i.e., transport of heat and particles in the scrape-off-layer (SOL) and divertors. Recent measurement by a high-speed scrape-off-layer current (SOLC) diagnostic may indicate that the ELM trigger process lies, in part, in the SOL. Thermoelectrically driven SOLC precedes, or co-evolves with, other parameters of the ELM process, and thus can potentially play a causal role: error field generated by non-axisymmetric SOLC, flowing in the immediate vicinity (approximately 1 centimeter) of the plasma edge, may contribute toward destabilizing MHD modes. The SOLC, observed concurrently with MHD activity, including ELMs, has been reported elsewhere.

NTIS

*Actuators; Diverters; Tokamak Devices*

**20060002763** Princeton Univ., NJ USA

**Global Hybrid Simulations of Energetic Particle Effects on the n=1 Mode in Tokamaks: Internal Kink and Fishbone Instability**

Fu, G. Y.; Park, W.; Strauss, H. R.; Breslau, J.; Chen, J.; Aug. 2005; 34 pp.; In English

Report No.(s): DE2005-842537; PPPL-4095; No Copyright; Avail.: Department of Energy Information Bridge

Global hybrid simulations of energetic particle effects on the n=1 internal kink mode have been carried out for tokamaks. For the International Thermonuclear Experimental Reactor (ITER), it is shown that alpha particle effects are stabilizing for the internal kink mode. However, the elongation of ITER reduces the stabilization effects significantly. Nonlinear simulations of the precessional drift fishbone instability for circular tokamak plasmas show that the mode saturates due to flattening of the particle distribution function near the resonance region. The mode frequency chirps down rapidly as the flattening region expands radially outward. Fluid nonlinearity reduces the saturation level.

NTIS

*Energetic Particles; Simulation; Tokamak Devices; Plasmas (Physics)*

**20060002825** Lawrence Livermore National Lab., Livermore, CA USA

**Detailed Hydrodynamic and X-ray Spectroscopic Analysis of a Laser-Produced Rapidly-Expanding Aluminum Plasma**

Chambers, D. M.; Glenzer, S. H.; Hawreliak, J.; Wolfrum, E.; Gouveia, A.; Apr. 03, 2001; 26 pp.; In English

Report No.(s): DE2005-15013272; UCRL-JC-140363; No Copyright; Avail.: Department of Energy Information Bridge

We present a detailed analysis of K-shell emission from laser-produced rapidly expanding aluminum plasmas. This work forms part of a series of experiments performed at the Vulcan laser facility of the Rutherford Appleton Laboratory, UK. 1-D planar expansion was obtained by over-illuminating Al-microdot targets supported on CH plastic foils. The small size of the Al-plasma ensured high spatial and frequency resolution of the spectra, obtained with a single crystal spectrometer, two vertical dispersion variant double crystal spectrometers, and a vertical dispersion variant Johann Spectrometer. The hydrodynamic properties of the plasma were measured independently by spatially and temporally resolved Thomson scattering, utilizing a 4 probe beam. This enabled sub- and super- critical densities to be probed relative to the 1 heater beams.

The deduced plasma hydrodynamic conditions are compared with those generated from the 1-D hydro-code Medusa, and the significant differences found in the electron temperature discussed. Synthetic spectra generated from the detailed term collisional radiative non-LTE atomic physics code Fly are compared with the experimental spectra for the measured hydrodynamic parameters, and for those taken from Medusa. Excellent agreement is only found for both the H- and He-like Al series when careful account is taken of the temporal evolution of the electron temperature.

NTIS

*Aluminum; Laser Plasma Interactions; Metallic Plasmas; Spectroscopic Analysis; X Ray Analysis*

**20060002827** Lawrence Livermore National Lab., Livermore, CA USA

**Comparison of Plasma Parameters Between QH and ELMing Phase of the Same Discharges**

Lasnier, C. L.; West, W. P.; Burrell, K. H.; DeGarsie, J. S.; Doyle, E. J.; May 2004; 22 pp.; In English

Report No.(s): DE2005-15014174; UCRL-CONFF-204347; No Copyright; Avail.: Department of Energy Information Bridge

No abstract available

*Plasma Control; Plasmas (Physics); Tokamak Devices*

**20060002828** Lawrence Livermore National Lab., Livermore, CA USA

**Analyses of Divertor Regimes in NSTX**

Soukanovskii, V. A.; Maingi, R.; Bush, C.; Paul, S. F.; Kaita, R.; May 2004; 22 pp.; In English

Report No.(s): DE2005-15014261; UCRL-CONF-204571; No Copyright; Avail.: National Technical Information Service (NTIS)

Identification of divertor operating regimes is of particular importance for heat and particle control optimization in high performance plasmas of a spherical torus, because of the magnetic geometry effects and compactness of the divertor region.

NTIS

*Diverters; Tokamak Devices; Toruses*

**20060002830** Lawrence Livermore National Lab., Livermore, CA USA

**Empirical Study of Ne in H-Mode Pedestal in DIII-D**

Groebner, R. J.; Osborne, T. H.; Fenstermacher, M. E.; Leonard, A. W.; Dec. 02, 2004; 10 pp.; In English

Report No.(s): DE2005-15014432; UCRL-CONF-208338; No Copyright; Avail.: National Technical Information Service (NTIS)

There is compelling empirical (1) and theoretical (2) evidence that the global confinement of H-mode discharges increases as the pedestal pressure or temperature increases. Therefore, confidence in the performance of future machines requires an ability to predict the pedestal conditions in those machines. At this time, both the theoretical and empirical understanding of transport in the pedestal are incomplete and are inadequate to predict pedestal conditions in present or future machines. Recent empirical results might be evidence of a fundamental relation between the electron temperature  $T_{(sub\ e)}$  and electron density  $n_{(sub\ e)}$  profiles in the pedestal. A data set from the ASDEX-Upgrade tokamak has shown that  $(\eta)_{(sub\ e)}$ , the ratio between the scale lengths of the  $n_{(sub\ e)}$  and  $T_{(sub\ e)}$  profiles, exhibits a value of about 2 throughout the pedestal, despite a large range of the actual density and temperature values (3). Data from the DIII-D tokamak show that over a wide range of pedestal density, the width of the steep gradient region for the  $T_{(sub\ e)}$  profile is about 1-2 times the corresponding width for the  $n_{(sub\ e)}$  profile, where both widths are measured from the plasma edge (4). Thus, the barrier in the density might form a lower limit for the barrier in the electron temperature.

NTIS

*Plasma Control; Electron Density Profiles; Plasmas (Physics); Confinement*

**20060002852** Lawrence Livermore National Lab., Livermore, CA USA

**X-ray Spectropolarimetry of High Temperature and High Density Plasma Supported by LLNL Electron Beam Ion Trap Experiments**

Shlyaptseva, A. S.; Kantsyrev, V. L.; Quart, N. D.; Neillin, P.; Harris, C.; Mar. 15, 2004; 18 pp.; In English

Report No.(s): DE2005-15013891; UCRL-PROC-202994; No Copyright; Avail.: National Technical Information Service (NTIS)

Plasma polarization spectroscopy work done by our group since the 3rd US-Japan PPS Workshop is overviewed. Theoretically, the polarization dependence on various electron distribution functions for He-like, Ne-like, and Ni-like x-ray transitions for a wide range of Z has been investigated. In particular, this study was focused on the polarization dependence

for monoenergetic and steep electron distribution functions. The diagnostically important spectral lines and features of K-, L-, and M-shell ions were identified which can be used in x-ray spectropolarimetry of plasma. Importance of polarization-sensitive LLNL Electron Beam Ion Trap data is emphasized. The results of the UNR polarization-sensitive Ti and Mo x-pinch experiments are discussed.

NTIS

*Electron Beams; Electron Plasma; High Temperature; Ion Beams; Polarimeters; Polarimetry; Spectroscopy*

**20060002951** Lawrence Livermore National Lab., Livermore, CA USA

**Supersonic Gas Jet for Fueling Experiments on NSTX**

Sokhanovskii, V.; Kugel, H. W.; Kaita, R.; Majewski, R.; Roquemore, A. L.; Jun. 2004; 12 pp.; In English

Report No.(s): DE2005-15014436; UCRL-CONF-205110; No Copyright; Avail.: National Technical Information Service (NTIS)

A new method for re-fueling a high temperature fusion plasma with a supersonic gas jet has been developed on the HL-1M tokamak and later implemented on several nuclear fusion plasma facilities. The method favorably compares to the conventionally used fueling methods: subsonic gas injection at the plasma edge, and high velocity cryogenic fuel pellet injection into the plasma core. Experiments have demonstrated a fueling efficiency of 0.3 - 0.6, reduced interaction of injected gas with in-vessel components, and therefore a higher wall saturation limit, and a general simplicity of the method. Several models have been used to explain the enhanced penetration of the jet into the plasma: a cold channel model, an electrostatic double-layer shielding model, and a rapid plasma cooling leading to the increase in the ionization and dissociation length together with the polarization.

NTIS

*Gas Jets; Plasma Diagnostics; Refueling; Supersonic Flow; Supersonic Nozzles*

**20060002956** Lawrence Livermore National Lab., Livermore, CA, USA, Washington State Univ., Pullman, WA, USA, International Business Machines Corp., White Plains, NY, USA

**Study of Positronium in Low-k Dielectric Films by Means of 2D-Angular Correlation Experiments at a High-Intensity Slow-Positron Beam**

Gessmann, T.; Petkov, M. P.; Weber, M. H.; Lynn, K. G.; Rodbell, K. P.; January 2005; 10 pp.; In English

Report No.(s): DE2005-15013214; UCRL-JC-144376; No Copyright; Avail.: Department of Energy Information Bridge

Depth-resolved measurements of the two-dimensional angular correlation of annihilation radiation (2D-ACAR) were performed at the high-intensity slow-positron beam of Lawrence Livermore National Laboratory. We studied the formation of positronium in thin films of methylsilsequioxane (MSSQ) spin-on glass containing open-volume defects in the size of voids. Samples with different average void sizes were investigated and positronium formation could be found in all cases. The width of the angular correlation related to the annihilation of parapositronium increased with the void size indicating the annihilation of non-thermalized parapositronium.

NTIS

*Angular Correlation; Annihilation Reactions; Dielectrics; Positronium; Positrons; Radiation Dosage*

**20060003037** Lawrence Livermore National Lab., Livermore, CA USA

**Pressure Gradient Effects On Two-Dimensional Plasma Expansion**

Moon, S.; Smith, R. F.; Dunn, J.; Keenan, R.; Nilsen, J.; Oct. 18, 2004; 10 pp.; In English

Report No.(s): DE2005-15014567; UCRL-PROC-207291; No Copyright; Avail.: Department of Energy Information Bridge

The electron density evolution of a laser-heated Al plasma is measured using a diffraction grating interferometer (DGI) at different times, relative to the peak of a 600ps plasma forming pulse. This gives an effective moving picture of how the plasma evolves in space and in time. The experimental results show pronounced two dimensional effects such as significant lateral transport and an on-axis density dip. We use 2-D hydrodynamic simulations in order to calculate the contributions of various physical mechanisms driving the plasma expansion. Density depressions have been observed before for high intensities laser drivers (ponderomotive force) and for lower intensities where the pumping pulse lasts for several nanoseconds (coronal x-ray ray heating). For the plasma conditions explored here, simulations suggest that the on-axis density dip can be explained by rapid movement of material laterally due to the large pressure gradients set up by the tightly focused laser beam.

NTIS

*Plasma Density; Plasmas (Physics); Pressure Gradients*

## SOLID-STATE PHYSICS

Includes condensed matter physics, crystallography, and superconductivity. For related information see also 33 *Electronics and Electrical Engineering*; and 36 *Lasers and Masers*.

**20060002844** Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA

**Ponderomotive Instabilities and Microphonics A Tutorial**

Delayen, J. R.; January 2005; 10 pp.; In English

Report No.(s): DE2005-850167; No Copyright; Avail.: National Technical Information Service (NTIS)

Phase and amplitude stabilization of the fields in superconducting cavities in the presence of ponderomotive effects and microphonics was one of the major challenges that had to be surmounted in order to make superconducting rf accelerators practical. This was of particular concern in low-velocity proton and ion accelerators since the beam loading was often negligible, but was usually not relevant in electron accelerators since the beam loading was often high and the gradients low. More recent or future applications of electron linacs--for example JLab upgrade, energy recovering linacs (ERLs)--will operate at increasingly higher gradients with little beam loading, and the issues associated with microphonics and ponderomotive instabilities will again become relevant areas of research. This paper will describe the ponderomotive instabilities and the conditions under which they can occur, and review the methods by which they, and microphonics, can be overcome.

NTIS

*Stability; Cavities*

**20060002880** California Univ., Santa Cruz, CA, USA

**Random-field Ising Model at High Magnetic Concentration**

Belanger, D. P.; Jan. 2005; 18 pp.; In English

Report No.(s): DE2005-838773; No Copyright; Avail.: Department of Energy Information Bridge

During the project period we have largely completed our characterization of the critical behavior of the random-field Ising model (RFIM) transition in three dimensions. This has been a long sought-after goal, the transition having been first observed in the early 1980's.

NTIS

*Ising Model; Magnetic Fields*

**20060002902** Brookhaven National Lab., Upton, NY USA

**Performance Limitations in High-Energy Ion Colliders**

Fischer, W.; January 2005; 12 pp.; In English

Report No.(s): DE2005-15016108; BNL-73455; No Copyright; Avail.: Department of Energy Information Bridge

High-energy ion colliders (hadron colliders operating with ions other than protons) are premier research tools for nuclear physics. The collision energy and high luminosity are important design and operations considerations. The experiments also expect flexibility with frequent changes in the collision energy, detector fields, and ion species, including asymmetric collisions. For the creation, acceleration, and storage of bright intense ion beams limits are set by space charge, charge exchange, and intrabeam scattering effects. The latter leads to luminosity lifetimes of only a few hours for intense heavy ions beams. Currently, the Relativistic Heavy Ion Collider (RHIC) at BNL is the only operating high-energy ion collider. Later this decade the Large Hadron Collider (LHC), under construction at CERN, will also run with heavy ions.

NTIS

*Particle Accelerators; Energy; Heavy Ions*

**20060003034** Brookhaven National Lab., Upton, NY, USA

**RHIC Spin Collaboration Meetings XXXI, XXXII, XXXIII**

January 2005; 214 pp.; In English

Report No.(s): DE2005-15016042; BNL-73866; No Copyright; Avail.: Department of Energy Information Bridge

The RIKEN BNL Research Center (RBRC) was established in April 1997 at Brookhaven National Laboratory. It is funded by the 'Rikagaku Kenkyusho' (RIKEN, The Institute of Physical and Chemical Research) of Japan. The Center is dedicated to the study of strong interactions, including spin physics, lattice QCD, and RHIC physics through the nurturing of a new generation of young physicists. The RBRC has both a theory and experimental component. At present the theoretical group has 4 Fellows and 3 Research Associates as well as 11 RHIC Physics/University Fellows (academic year 2003-2004). To date

there are approximately 30 graduates from the program of which 13 have attained tenure positions at major institutions worldwide. The experimental group is smaller and has 2 Fellows and 3 RHIC Physics/University Fellows and 3 Research Associates, and historically 6 individuals have attained permanent positions. Beginning in 2001 a new RIKEN Spin Program (RSP) category was implemented at RBRC. These appointments are joint positions of RBRC and RIKEN and include the following positions in theory and experiment: RSP Researchers, RSP Research Associates, and Young Researchers, who are mentored by senior RBRC Scientists. A number of RIKEN Jr. Research Associates and Visiting Scientists also contribute to the physics program at the Center. RBRC has an active workshop program on strong interaction physics with each workshop focused on a specific physics problem. Each workshop speaker is encouraged to select a few of the most important transparencies from his or her presentation, accompanied by a page of explanation.

NTIS

*Particle Spin; Quantum Chromodynamics*

**20060003657** Bulgarian Academy of Sciences, Sofia, Bulgaria

**Non-Linear Resonance And Parametric Phenomena In A Complicated Oscillating Circuit**

Damgov, V. N.; Russeva, G. A.; Spasov, A. Y.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 835-838; In English; See also 20060003631; Copyright; Avail.: Other Sources

Non-linear resonance and parametric phenomena in an oscillating circuit with two non-linear opposite reactive elements and negative resistance are presented. The examination has been performed on the basis of a non-linear oscillating circuit represented by a two-transistor model of a p-n-p-n type device with non-linear inductance and negative resistance and a self-bias p-n junction with non-linear capacitance and a non-linear conductance.

Author

*Nonlinearity; Resonance; Oscillations; Circuits*

**20060003669** Raytheon Co., Waltham, MA, USA

**Monolithic Microwave Circuits Technology, Design, Applications, and Future Prospects**

Masse, Daniel; Pucel, Robert A.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982]; See also 20060003631; Copyright; Avail.: Other Sources

Monolithic microwave integrated circuits (MMICs) based on silicon on sapphire (SOS) and gallium arsenide GaAs technologies are being considered for satellite communications systems, airborne phased array radar, and other applications. This paper will consider the design philosophy and the technology of these circuits, review the progress achieved to date, and discuss their future prospects.

Author

*Microwave Circuits; Technology Utilization; Design Analysis; Gallium Arsenides*

**20060003708** Centro Studi e Laboratori Telecomunicazioni, Turin, Italy

**Use Of Wave Digital Networks For Time Domain Simulation Of Lossy Interconnections In Digital Systems**

Belforte, P.; Bostica, B.; Guaschino, G.; 1982 International Symposium on Circuits And Systems, Volume 3; [1982], pp. 784-787; In English; See also 20060003631; Copyright; Avail.: Other Sources

This paper deals with the application of a general method of circuit simulation to lossy transmission lines. The method consists in the time domain analysis of the electrical network to be simulated using its wave digital model. In particular in this application the digital equivalent of a lossy line is obtained by time domain reflectometer measurements of its scattering parameters. This approach allows a very strict integration between automatic measurements and processing. In this way a good agreement between simulated and actual waveforms can be achieved.

Author

*Digital Systems; Mathematical Models; Time Domain Analysis; Time Measurement*

**77**

**PHYSICS OF ELEMENTARY PARTICLES AND FIELDS**

Includes quantum mechanics; theoretical physics; and statistical mechanics. For related information see also 72 *Atomic and Molecular Physics*, 73 *Nuclear Physics*, and 25 *Inorganic, Organic and Physical Chemistry*.

**20060002743** Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA

**Design of Large Momentum Acceptance Transport Systems**

Douglas, D. R.; January 2005; 22 pp.; In English

Report No.(s): DE2005-842118; No Copyright; Avail.: National Technical Information Service (NTIS)

This is a series of slides providing a general discussion, an historical perspective, design principles and examples.  
NTIS  
*Momentum Transfer; Acceptability*

**20060002750** California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

**Top physics: search for electroweak single top quark production in p anti-p collisions at  $s^{1/2} = 1.96$  tev**

Acosta, D.; Adelman, J.; Affolder, T.; Akimoto, T.; Albrow, M. G.; Feb. 2005; 12 pp.; In English

Report No.(s): DE2005-842914; No Copyright; Avail.: Department of Energy Information Bridge

We report on a search for Standard Model t-channel and s-channel single top quark production in pp collisions at a center of mass energy of 1.96 TeV. We use a data sample corresponding to 162 pb recorded by the upgraded Collider Detector at Fermilab. We find no significant evidence for electroweak top quark production and set upper limits at the 95% confidence level on the production cross section, consistent with the Standard Model: 10.1 pb for the t-channel, 13.6 pb for the s-channel and 17.8 pb for the combined cross section of t- and s-channel.

NTIS

*Electroweak Interactions (Field Theory); Particle Collisions; Quarks*

**20060002762** California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

**Electroweak physics: measurement of  $\gamma$  and  $z$   $\gamma$  production in pp-bar collisions at  $s^{1/2} = 1.96$  tev**

Acosta, D.; Feb. 2005; 12 pp.; In English

Report No.(s): DE2005-842913; No Copyright; Avail.: National Technical Information Service (NTIS)

No abstract available

*Electroweak Interactions (Field Theory); Particle Collisions*

**20060002816** Brookhaven National Lab., Upton, NY USA, Fermi National Accelerator Lab., Batavia, IL, USA, Los Alamos National Lab., NM USA

**SciDAC Advanced and Applications in Computational Beam Dynamics**

Ryne, R.; Abell, D.; Adelman, A.; Amundson, J.; Bohn, C.; January 2005; 10 pp.; In English

Report No.(s): DE2005-843144; No Copyright; Avail.: Department of Energy Information Bridge

SciDAC has had a major impact on computational beam dynamics and the design of particle accelerators. Particle accelerators--which account for half of the facilities in the DOE Office of Science Facilities for the Future of Science 20 Year Outlook--are crucial for US scientific, industrial, and economic competitiveness. Thanks to SciDAC, accelerator design calculations that were once thought impossible are now carried routinely, and new challenging and important calculations are within reach. SciDAC accelerator modeling codes are being used to get the most science out of existing facilities, to produce optimal designs for future facilities, and to explore advanced accelerator concepts that may hold the key to qualitatively new ways of accelerating charged particle beams. In this poster we present highlights from the SciDAC Accelerator Science and Technology (AST) project Beam Dynamics focus area in regard to algorithm development, software development, and applications.

NTIS

*Particle Accelerators; Particle Beams; Research and Development; Charged Particles*

**20060002870** Brookhaven National Lab., Upton, NY USA, Tsukuba Univ., Japan

**On-Shell Improvement of the Massive Wilson Quark Action**

Aoki, S.; Kayaba, Y.; Kuramashi, Y.; Yamada, N.; January 2005; 26 pp.; In English

Report No.(s): DE2005-15015157; BNL-738421; No Copyright; Avail.: Department of Energy Information Bridge

We review a relativistic approach to the heavy quark physics in lattice QCD by applying a relativistic  $O(a)$  improvement to the massive Wilson quark action on the lattice. After explaining how power corrections of  $m(\text{sub } Q)a$  can be avoided and remaining uncertainties are reduced to be of order  $(a(\text{Lambda})_{\text{sub QCD}})^2$ , we demonstrate a determination of four improvement coefficients in the action up to one-loop level in a mass dependent way. We also show a perturbative determination of mass dependent renormalization factors and  $O(a)$  improvement coefficients for the vector and axial vector currents. Some preliminary results of numerical simulations are also presented.

NTIS

*Quantum Chromodynamics; Quarks*

## ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

**20060002802** Forest Service, Saint Paul, MN, USA

**Planning Guide for Small and Medium Size Wood Products Companies: The Keys to Success. A Step by Step Guide to Writing: Strategic Plans, Marketing Plans, Business Plans**

Howe, J.; Bratkovich, S.; Sep. 1995; 82 pp.; In English

Report No.(s): PB2006-102314; NA-TP-09-95; No Copyright; Avail.: CASI: [A05](#), Hardcopy

Today, wood products companies across North America are facing competitive pressure from numerous sources. Traditional products are being manufactured in new regions (e.g. developing nations), substitute products are being developed by competing industries (e.g. steel), and there is a strain on bottom lines brought about by greater restriction of natural resources and the general rising cost of doing business. All this is stretching the abilities of the wood products executive to the limit. Research has shown that a formal planning process is a key element in the success of manufacturing companies, especially with regard to developing new products and new markets. Recent research on wood products companies in Maine and Minnesota demonstrated that wood products firms recognized as industry role models were significantly more likely to have a formal planning process than the industry as a whole.

NTIS

*Industries; Marketing; Wood; Revenue; Budgeting*

**20060003030** Lawrence Livermore National Lab., Livermore, CA USA

**FY04 Engineering Technology Report. Technology Base**

Apr. 2005; 122 pp.; In English

Report No.(s): DE2005-15015934; No Copyright; Avail.: National Technical Information Service (NTIS)

Lawrence Livermore National Laboratory's Engineering Directorate has two primary discretionary avenues for its investment in technologies: the Laboratory Directed Research and Development (LDRD) program and the 'Tech Base' program. This volume summarizes progress on the projects funded for technology-base efforts in FY2004. The Engineering Technical Reports exemplify Engineering's more than 50-year history of researching and developing (LDRD), and reducing to practice (technology-base) the engineering technologies needed to support the Laboratory's missions. Engineering has been a partner in every major program and project at the Laboratory throughout its existence, and has prepared for this role with a skilled workforce and technical resources. This accomplishment is well summarized by Engineering's mission: 'Enable program success today and ensure the Laboratory's vitality tomorrow'. LDRD is the vehicle for creating those technologies and competencies that are cutting edge. These require a significant level of research or contain some unknown that needs to be fully understood. Tech Base is used to apply those technologies, or adapt them to a Laboratory need.

NTIS

*Research and Development; Research Projects*

**20060003041** Lawrence Livermore National Lab., Livermore, CA USA

**FY04 Engineering Technology Reports. Laboratory Directed Research and Development**

Apr. 2005; 80 pp.; In English

Report No.(s): DE2005-15015920; No Copyright; Avail.: National Technical Information Service (NTIS)

This report summarizes the science and technology research and development efforts in Lawrence Livermore National Laboratory's Engineering Directorate for FY2004, and exemplifies Engineering's more than 50-year history of developing the technologies needed to support the Laboratory's missions. Engineering has been a partner in every major program and project at the Laboratory throughout its existence and has prepared for this role with a skilled workforce and the technical resources developed through venues like the Laboratory Directed Research and Development Program (LDRD). This accomplishment is well summarized by 'Engineering's mission: Enable program success today and ensure the Laboratory's vitality tomorrow'. Engineering's investment in technologies is carried out through two programs, the 'Tech Base' program and the LDRD program.

NTIS

*Research and Development; Technologies; Records*

## DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer program documentation see *61 Computer Programming and Software*.

**20060002731** Kansas Univ. Center for Research, Inc., Lawrence, KS, USA

**Preparation of Northern Mic-Continent Petroleum Atlas**

January 2005; 48 pp.; In English

Report No.(s): DE2005-843019; No Copyright; Avail.: National Technical Information Service (NTIS)

Report covers the fifth year of the Digital Petroleum Atlas (DPA) Project. To the present day, the DPA remains a long-term effort to develop new methodologies for efficient and timely access to the latest petroleum data and technology for the domestic oil and gas industry, research organizations and local governmental units. The DPA is an evolving approach to generating and publishing petroleum reservoir, field, play and basin studies. Atlas products are integrated with the Kansas Geological Survey web site and are available for every field in Kansas (6,395 fields in Kansas), anywhere in the world using a standard point-and-click world-wide-web interface (<http://www.kgs.ku.edu/PRS/petroIndex.html>). In order to provide efficient transfer of the technology for client-defined solutions, all information and technology in the DPA can be accessed, manipulated and downloaded. The fifth year of the project moved forward to expand the development and integration of relational databases into the DPA. The result is that most of the pages in the DPA are generated on demand using online clients. Previously completed products, such as field and basin studies, are automatically updated with the latest production and well data. Raster images such as completion reports are scanned and uploaded into relational databases and can be used for efficient construction of larger scale studies. Content of the DPA has increased to cover every field in Kansas. The DPA Project continues to provide improved access to a 'published' product and ongoing technology transfer activity. The DPA is widely used by oil and gas producers and other groups interested in natural resources.

NTIS

*Crude Oil; Industries*

**20060002765** California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

**Documentation of Calculation Methodology, Input Data, and Infrastructure for the Home Energy Saver Web Site**

Pinckard, M. J.; Brown, R. E.; Mills, E.; Lutz, J. D.; Jul. 2005; 112 pp.; In English

Report No.(s): DE2005-842508; LBNL-51938; No Copyright; Avail.: National Technical Information Service (NTIS)

The Home Energy Saver (HES, <http://HomeEnergySaver.lbl.gov>) is an interactive web site designed to help residential consumers make decisions about energy use in their homes. This report describes the underlying methods and data for estimating energy consumption. Using engineering models, the site estimates energy consumption for six major categories (end uses); heating, cooling, water heating, major appliances, lighting, and miscellaneous equipment. The approach taken by the Home Energy Saver is to provide users with initial results based on a minimum of user input, allowing progressively greater control in specifying the characteristics of the house and energy consuming appliances. Outputs include energy consumption (by fuel and end use), energy-related emissions (carbon dioxide), energy bills (total and by fuel and end use), and energy saving recommendations. Real-world electricity tariffs are used for many locations, making the bill estimates even more accurate. Where information about the house is not available from the user, default values are used based on end-use surveys and engineering studies. An extensive body of qualitative decision-support information augments the analytical results.

NTIS

*Energy Consumption; Websites; Computation*

**20060002777** Interior Dept., Washington, DC USA

**Recreation One-Stop Best Practices White Paper**

Feb. 24, 2003; 58 pp.; In English

Report No.(s): PB2006-102231; No Copyright; Avail.: CASI: [A04](#), Hardcopy

The Department of the Interior (DOI), leveraging its Recreation.gov website, volunteered to lead the cross-government, Recreation One-Stop initiative. This E-government initiative seeks to build a user-friendly, web-based, one-stop recreation resource for citizens, offering a single point of access to recreational opportunities nationwide. The goal is to offer better and improved citizen-centric services to visitors planning their vacations to government parks and recreation centers in the USA. The initiative builds on the Recreation.gov website that currently provides information and access to Federal parks and facilities managed by 12 Federal agencies such as the National Park Service, the U.S. Forest Service and the US Army Corp

of Engineers. The goal of Recreation One-Stop is to extend this successful model to tribal, state and local government parks and recreation facilities. The Department of the Interior (DOI) requested that the Federal CIO Council Best Practices Committee conduct a best practices study of issues related to the development of the Recreation One-Stop initiative. The report presents results of the study.

NTIS

*Information Dissemination; Procedures; Recreation; Websites*

**20060002807** National Inst. of Standards and Technology, Gaithersburg, MD USA

**Weights and Measures Directory 2002**

Sebring, L. T.; Jan. 2002; 214 pp.; In English

Report No.(s): PB2002-101825; NISTIR-6500-2002ED; No Copyright; Avail.: CASI: [A10](#), Hardcopy

This directory is a compilation of persons and organizations associated with the profession of weights and measures. It contains four lists: (1) State weights and measures directors; (2) weights and measures staff under each jurisdiction; (3) State personnel involved in petroleum testing; and (4) Federal contacts. A list of National Institute of Standards and Technology (NIST) Office of Weights and Measures staff is included in the directory as well as a table showing their specific areas of responsibility. Additionally, this directory contains Internet Web Sites relevant to weights and measures activities.

NTIS

*Directories; Metrology; Personnel; Human Resources*

**20060002863** Argonne National Lab., Idaho Falls, ID, USA

**ACIS Design Compliance with Principal Accelerator Safety Interlock Design Requirements**

Knott, M.; Dec. 2004; 28 pp.; In English

Report No.(s): DE2005-843177; ANL/APS/LS-308; No Copyright; Avail.: Department of Energy Information Bridge

Prior to and during the design of the APSs Access Control Interlock System (ACIS), an effort was made to insure that the design complied with the relevant DOE and ANL requirements as well as those set forth in other recognized documents then in circulation. A paragraph-by-paragraph listing of the requirements (in some cases, recommended practices) and the corresponding ACIS design features was compiled for use by the review committees then in place. This tabulation was incorporated in the APS Safety Analysis Document (SAD) as Appendix A. With the evolutionary changes that have occurred to the APS and to the documents referenced, some of the details of these compliances have evolved as well. It has been decided to maintain the SAD as a living document, editing it in close time proximity to the evolving APS. Since Appendix A depicted the ACISs original design compliance to an also-evolving set of documents, it was decided to remove Appendix A but to retain it as a reference document. This LS Note now contains that set of original design compliances. As the APS and the ACIS continue to evolve, the changes made will be subject to internal review and approval and will always be subject to the requirements set forth by the DOE and ANL.

NTIS

*Access Control; Safety; Accelerators*

**20060002941** Mountain-Plains Consortium, Fargo, ND, USA

**Traveler Information Systems Evaluation of UDOT's ATIS Technologies**

Martin, P. T.; Lahon, D.; Cook, K.; Stevanovic, A.; Nov. 2005; 60 pp.; In English

Report No.(s): PB2006-101278; MPC-05-175; No Copyright; Avail.: CASI: [A04](#), Hardcopy

This report details the findings of a study on the Utah Department of Transportation's (UDOT's) Advanced Traveler Information Systems (ATISs). The purpose of the study was to determine the public's awareness and use of four main ATISs, namely Variable message Signs (VMS), Highway Advisory Radio (HAR), the 511 phone system, and the CommuterLink website. Based on the findings from the public survey, the analysis of UDOT's 511 and the CommuterLink website logs, it was found that ATIS use is increasing. It was recommended that marketing and outreach programs should be focused on awareness as well as education.

NTIS

*Air Traffic Control; Control Equipment; Highways; Information Systems; Traffic*

**20060002975** Lawrence Livermore National Lab., Livermore, CA USA

**Photonuclear Benchmarks with a Comparison COG and MCNPX Results**

Henrichs, D. P.; Lent, E. M.; Oct. 24, 2003; 20 pp.; In English

Report No.(s): DE2005-15013820; UCRL-CONF-200552; No Copyright; Avail.: National Technical Information Service (NTIS)

The Nuclear Data Section of the International Atomic Energy Agency (IAEA) has distributed an evaluated photonuclear data library in standard ENDF-6 format that is intended for use in transport codes. This 'IAEA Photonuclear Data Library' consists of a number of individual ASCII text files for various elements that have been recently processed into the single binary (COG data library) file 'COGPNUC' with corresponding changes to the COG code for use in transport calculations involving photonuclear reactions. Barber and George have measured the total neutron yields produced by the bombardment of thick targets of C, Al, Cu, Ta, Pb, and U by mono-energetic beams of electrons.

NTIS

*Data Bases; Photonuclear Reactions*

**20060002995** Commerce Dept., Washington, DC, USA, Department of Education, Washington, DC, USA  
**Visions 2020.2: Student Views on Transforming Education and Training Through Advanced Technologies**

Aug. 2005; 34 pp.; In English

Report No.(s): PB2006-103688; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Advances in both cognitive science and information technology have the potential to transform education and training in ways previously unimaginable. Advanced technologies under development by U.S. businesses, universities, and government could create rich and compelling learning opportunities that meet all learners needs, and provide education and training when and where they are needed, while boosting the productivity of learning and lowering its costs. These technologies could play a major role in meeting education and training challenges in the years ahead, and help make the U.S. workforce more competitive globally. The development and deployment of these technologies involve matters related to technological innovation, a mission area of the U.S. Department of Commerce. To lay the groundwork for Federal leadership in learning technology innovation, in September 2002, the Commerce Department published Visions 2020: Transforming Education and Training through Advanced Technologies. For Visions 2020, a number of distinguished individuals and teams from a wide range of technology and education fields were asked to look out into the future, and describe what technology-enabled learning experiences could be like. They responded with a rich collection of visions, some of which are excerpted in this report. Visions 2020 identified potential technologies, their application for learning, and how the learning environment would need to change to take full advantage of them. With a future vision in hand, the Commerce Department convened a Summit on the Use of Advanced Technologies in Education and Training. At the Summit, stakeholder groups identified ways to encourage technology-enabled transformation in U.S. education and training.

NTIS

*Education; Students*

**20060003070** Bell Telephone Labs., Inc., Murray Hill, NJ, USA

**A Training Procedure for a Segment-Based-Network Approach to Isolated Word Recognition**

Soong, F. K.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 17.1.1 - 17.1.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

No abstract available

*Words (Language); Isolators*

**20060003127** Stanford Univ., CA, USA

**Fast Algorithms for Vector Quantization Picture Coding**

Equitz, William; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 18.1.1 - 18.1.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

Two methods for reducing the computation involved in vector quantization picture coding are presented. First, a data structure (k-d trees, developed by Bentley) is demonstrated to be appropriate for implementing exact nearest neighbor searching in time logarithmic in codebook size. Second, the Pairwise Nearest Neighbor (PNN) algorithm is presented as an alternative to the generalized Lloyd (Linde-Buzo-Gray) algorithm. The PNN algorithm derives a vector quantization codebook in a diminishingly small fraction of the time previously required, without sacrificing performance. Simulations on a variety of images coded at 1/2 bit per pixel indicate that PNN codebooks can be developed in roughly 5% of the time required by the LBG algorithm. The PNN algorithm can be used with squared error and weighted squared error distortion measures. These results are generalizable to any vector quantization application with the appropriate distortion measure.

Author

*Vector Quantization; Coding; Algorithms; Images; Data Structures*

**20060003145** Philips G.m.b.H., Hamburg, Germany

**Construction of Language Models for Spoken Data Base Queries**

Mergel, D.; Paeseler, A.; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 20.13.1 - 20.13.4; In English; See also 20060003045

Contract(s)/Grant(s): BFMI-413-5839; Copyright; Avail.: Other Sources

In this paper we describe the construction of language models (finite-state networks) for a question-answering system handling database queries via spoken input (German), and report on sentence-understanding experiments with them. The world model representing the content of the permitted questions is given by a semantic structure with 5 object classes, 3 additional attribute classes and 14 relations between them. The sentence structures (6 main types) are organized as a regular grammar. Acoustic recognition experiments show that the perplexity rather than the number of transitions determines the search expenditure and the error rate.

Author

*Data Bases; Grammars; Speech; Errors; Sentences*

**20060003147** NEC Corp., Kawasaki, Japan, Japan

**Large Vocabulary Word Detection by Searching in a Tree-Structural Word Dictionary**

Hatazaki, Kaichiro; Watanabe, Takao; IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '87); Volume 2; 1987, pp. 20.14.1 - 20.14.4; In English; See also 20060003045; Copyright; Avail.: Other Sources

A large vocabulary word detection method is presented for use with a Japanese continuous speech recognizer. This word detector receives a syllable lattice resulting from syllable recognition of a continuously spoken Japanese word sequence, and produces word candidates and their locations in speech as output. Top-down word detection using a tree-structural word dictionary is carried out to allow the toleration of syllable recognition errors in the syllable lattice and to reduce computational cost. All word candidates at arbitrary locations in the lattice are detected by traversing the dictionary only once. In order to reduce the space explored in the dictionary, nodes whose syllable symbols are contained in the lattice are marked before traversing the dictionary. As the result of evaluation experiments for a 4000 word vocabulary, the correct word candidates were detected in the top 2.5% and 20% of the vocabulary with error rates less than 9% and 4%, respectively.

Author

*Words (Language); Dictionaries; Detection; Syllables; Speech*

**83**

**ECONOMICS AND COST ANALYSIS**

Includes cost effectiveness studies.

**20060002943** Congressional Budget Office, Washington, DC, USA

**Macroeconomic and Budgetary Effects of Hurricane Katrina**

Sep. 06, 2005; 14 pp.; In English

Report No.(s): PB2006-102191; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Katrina could dampen real gross domestic product (GDP) growth in the second half of the year by one half to 1 percentage point and reduce employment through the end of this year by about 400,000. Most economic forecasters had expected 3 percent to 4 percent growth during the second half, and employment growth of 150,000 to 200,000 per month. Economic growth and employment are likely to rebound during the first half of 2006 as rebuilding accelerates. The Congress has appropriated \$10.5 billion for spending on emergency relief, and many analysts expect more to be provided in the near future. Katrina will affect the budget in a number of ways in addition to the emergency spending-outlays may be affected by disruptions in the submission or processing of claims for federal payments, reductions in royalty payments from oil and gas drilling, and the sale of oil from the Strategic Petroleum Reserve; and tax receipts will be affected by immediate reductions in national income and gasoline consumption, along with temporary tax relief provided by the Internal Revenue Service-but it is still too soon to estimate what the net effects on the budget might be.

NTIS

*Hurricanes; Economics; Revenue; Budgeting; Emergencies*

## 89 ASTRONOMY

Includes observations of celestial bodies; astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

**20060002789** Geological Survey, Flagstaff, AZ, USA, State Univ. of New York, Buffalo, NY, USA, Naval Research Lab., Washington, DC, USA

**Abstracts of the Annual Meeting of Planetary Geologic Mappers. Held in Washington, DC. on June 23-24, 2005**

Gregg, T. K. P.; Tanaka, K. L.; Saunders, R. S.; January 2005; 54 pp.; In English; Abstracts of the Annual Meeting of Planetary Geologic Mappers., June 23 - 24, 2005, Washington, DC.

Report No.(s): PB2006-102326; USGS-OFR-2005-1271; No Copyright; Avail.: National Technical Information Service (NTIS)

Approximately 30 people attended the annual Planetary Mappers Meeting. The meeting was held at the National Air and Space Museum. The discussions focused on extraterrestrial geologic studies. This document contains abstracts of the presentations.

NTIS

*Mapping; Planetary Geology; Planetary Mapping*

**20060002872** Lawrence Livermore National Lab., Livermore, CA USA

**Extreme Adaptive Optics Testbed: Results and Future Work**

Evans, J. W.; Sommargren, G.; Poyneer, L.; Macintosh, B.; Sevenson, S.; Jul. 21, 2004; 12 pp.; In English

Report No.(s): DE2005-15014457; UCRL-CONF-205378; No Copyright; Avail.: National Technical Information Service (NTIS)

Extreme adaptive optics systems are optimized for ultra-high-contrast applications, such as ground-based extrasolar planet detection. The Extreme Adaptive Optics Testbed at UC Santa Cruz is being used to investigate and develop technologies for high-contrast imaging, especially wavefront control. A simple optical design allows us to minimize wavefront error and maximize the experimentally achievable contrast before progressing to a more complex set-up. A phase shifting diffraction interferometer is used to measure wavefront errors with sub-nm precision and accuracy. We have demonstrated RMS wavefront errors of  $\sim 1.3$  nm and a contrast of  $\sim 10^{-7}$  over a substantial region using a shaped pupil. Current work includes the installation and characterization of a 1024-actuator Micro-Electro-Mechanical- Systems (MEMS) deformable mirror, manufactured by Boston Micro-Machines, which will be used for wavefront control. In our initial experiments we can flatten the deformable mirror to 1.8-nm RMS wavefront error within a control radius of 5-13 cycles per aperture. Ultimately this testbed will be used to test all aspects of the system architecture for an extrasolar planet-finding AO system.

NTIS

*Adaptive Optics; Images*

## 90 ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

**20060002737** Lawrence Livermore National Lab., Livermore, CA USA

**Next Generation Microlensing Search: SuperMacho**

Drake, A. J.; Becker, A. C.; Clocchiati, A.; Cook, K. H.; Covarrubias, R.; Oct. 27, 2003; 14 pp.; In English

Report No.(s): DE2005-15013810; UCRL-PROC-200594; No Copyright; Avail.: Department of Energy Information Bridge

Past microlensing experiments such as the MACHO project have discovered the presence of a larger than expected number of microlensing events towards the Large Magellanic Cloud (LMC). These events could represent a large fraction of the dark matter in the halo of our Galaxy, if they are indeed due to halo lenses. However, the locations of most of the lenses are poorly defined. The Super Macho project will detect and follow up approx. 60 microlensing events toward the LMC over the next 5 years. The expected discovery of a number of microlensing events exhibiting special properties due to binarity, etc., will allow us to better determine the location and nature of the lenses causing the LMC microlensing events.

NTIS

*Galactic Structure; Gravitational Lenses*

**20060002963** Lawrence Livermore National Lab., Livermore, CA USA

**Stellar Opacity**

Rogers, F. J.; Iglesias, C. A.; Nov. 07, 1999; 26 pp.; In English

Report No.(s): DE2005-15013183; UCRL-JC-137066; No Copyright; Avail.: Department of Energy Information Bridge

As long ago as 1926 Eddington identified opacity as one of two clouds obscuring stellar model calculations: the source of stellar energy being the other. At that time it was thought that bound-bound absorption was not a significant source of opacity. It was 40 years later that Cox and Stewart included spectral lines in opacity calculations. This led to opacity increases exceeding a factor of three at some temperature-density conditions. These enhanced opacities greatly improved the quality of stellar models. Even so, several properties of stars known to be sensitive to opacity resisted explanation.

NTIS

*Opacity; Stars; Stellar Models*

**20060002965** Lawrence Livermore National Lab., Livermore, CA USA

**Interaction of Supernova Remnants with Interstellar Clouds: Experiments on the Nova Laser**

Klein, R. L.; Budil, K. S.; Perry, T. S.; Bach, D. R.; Apr. 18, 2002; 52 pp.; In English

Report No.(s): DE2005-15013481; UCRL-ID-148071; No Copyright; Avail.: National Technical Information Service (NTIS)

The interaction of strong shock waves, such as those generated by the explosion of supernovae with interstellar clouds, is a problem of fundamental importance in understanding the evolution and the dynamics of the interstellar medium (ISM) as it is disrupted by shock waves. Here we present the results of a series of Nova laser experiments investigating the evolution of a high density sphere embedded in a low density medium after the passage of a strong shock wave, thereby emulating the supernova shock-cloud interaction. The Nova laser was utilized to generate a strong (-Mach 10) shock wave that traveled along a miniature beryllium shock tube, 750  $\mu\text{m}$  in diameter, filled with a low-density plastic emulating the ISM. Embedded in the plastic was a copper microsphere (100  $\mu\text{m}$  in diameter) emulating the interstellar cloud. The morphology and evolution as well as the shock wave trajectory were diagnosed via side-on X-ray radiography.

NTIS

*Lasers; Supernovae*

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